

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

2SD11
R23

C2



United States
Department of
Agriculture

Forest Service

Alaska Region
R10-MB-113



Timber Supply and Demand

1989 Report

1115



Alaska National Interest Lands Conservation Act
Section 706(a), Report Number 9

**TIMBER
SUPPLY AND DEMAND**

1989 Report

**Alaska National Interest Lands Conservation Act
Section 706(a), Report Number 9**

**USDA Forest Service, Alaska Region
September 1990**

PREFACE

Section 706(a) of the Alaska National Interest Lands Conservation Act (ANILCA) states that the Secretary of Agriculture will monitor timber supply and demand in Southeast Alaska and report annually on the ability of the Tongass National Forest to meet a timber supply rate of 4.5 billion board feet per decade specified in Section 705. This report is submitted to the Committee of Energy and Natural Resources of the U.S. Senate and the Committee on Interior and Insular Affairs of the House of Representatives. The report is prepared by the USDA Forest Service, Alaska Region in consultation with the State of Alaska, affected Native corporations, the Alaskan timber industry, the Southeast Alaska Conservation Council, and the Alaska Land Use Council in accordance with Section 706(c) of ANILCA. These parties are known as ANILCA cooperators.

Increasingly, Southcentral Alaska has become a participant with Southeast Alaska in the expanding Pacific Rim marketplace for wood products. Confirmation of this trend includes an expanding softwood log trade originating from Southcentral Alaska and the installation of a major new sawmill by the Chugach Alaska Corporation. To promote further communication and coordination between the public and private sector on forest management issues, this ninth timber supply and demand report includes references to the forest resources and industry's activities in Southcentral Alaska.

This report is based on information gathered by the USDA Forest Service from federal agencies, published reports, trade journals, etc. Comments on the report were solicited from the ANILCA cooperators and other industry experts, consultants, researchers, special interest groups, professional organizations, and interested individuals.

EXECUTIVE SUMMARY

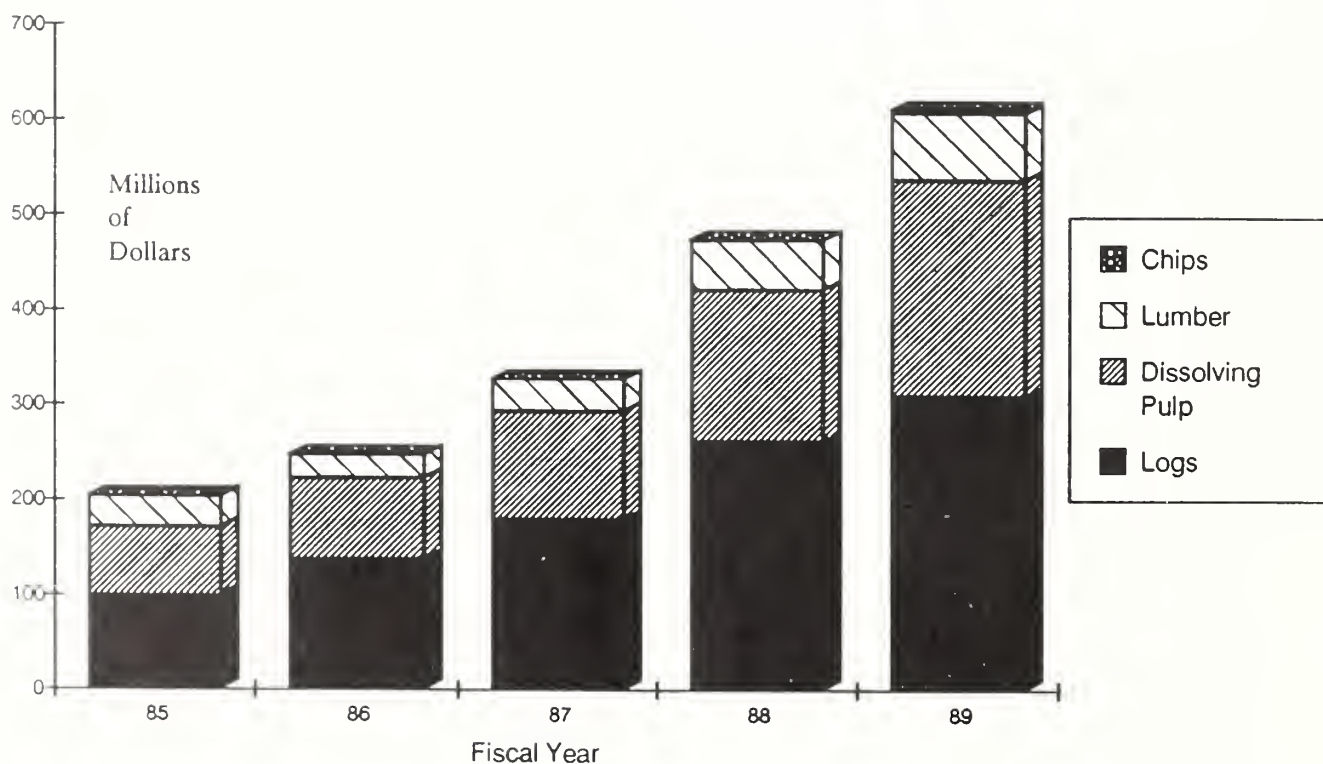
Rapid Expansion of Exports

Continued economic expansion in the United States and the Pacific Basin coupled with a more internationally competitive dollar fueled rapid growth in Alaskan exports of forest products in fiscal year 1989 (October 1, 1988 - September 30, 1989). The value of forest products exported to foreign countries from Alaska has increased from \$204.5 million in fiscal year 1985 to \$612.7 million in fiscal year 1989 (Figure 1). The boost in competitiveness from currency shifts plus market growth lifted prices for some Alaskan forest products exports to new highs.

International exports of softwood logs from Alaska exceeded \$310 million in fiscal year 1989, growing 30.6 percent in volume from 482 million board feet (MMBF) last year to more than 629 MMBF this fiscal year. The average market value for all log exports was \$493 per thousand board feet (MBF). The major markets for Alaska's output of softwood logs in fiscal year 1989 were Japan, South Korea, Canada, China and Taiwan.

The value of Alaskan lumber exported to foreign destinations have almost tripled over the last three fiscal years rising from \$24.7 million in 1986 to more than \$71 million in 1989. The average market value for lumber products shipped from Alaska to foreign ports was a record \$389 per MBF. Within the next year, continued expansion in Alaskan lumber production is expected as at least one new lumber processor begins operating a new facility.

Figure 1. Value of International Exports of Alaskan Forest Products



In addition to supplying domestic producers, Alaska's forest products industry exports high-quality pulp products which are competitive worldwide. In fiscal year 1989, Alaskan manufacturers exported more than \$227 million in pulp products to 18 countries in Asia, Europe and Latin America. The average market value for pulp exported from Alaska in fiscal year 1989 was a record \$767 per metric ton. Skyrocketing prices for paper-grade pulps in 1986-1987 encouraged suppliers with the ability to switch out of dissolving grades into chemical pulps to supply the rapidly growing market for printing and writing papers. This exodus of producers from the dissolving grades had Alaskan pulp manufacturers well-positioned to serve the rebounding market for dissolving pulp.

Competition for Wood Fiber in the Pacific Rim Intensifies

The supply of wood fiber in Southeast Alaska and the Pacific Rim was very tight in fiscal year 1989. A clear indicator was the expanding export market for wood chips. Japanese buyers returned to Southeast Alaska in fiscal year 1989 to acquire 85,900 short tons of chips. The resumption of an export market for chips means fuller utilization of wood residue on private lands with better incentives for forest management as competition for fiber intensifies.

Harvest on the Tongass National Forest increases 12 percent

National Forest timber harvest in fiscal year 1989 was up 12 percent from 1988. Timber-sale operators harvested 377 MMBF of sawtimber from the Tongass National Forest. An additional 67.6 MMBF in utility volume was taken yielding a total harvest of 444.6 MMBF from the Tongass.

Implications for Resource Management

The strong market has fostered three trends which will promote the timber management objectives expressed in the Tongass Land Management Plan and ANILCA section 705:

- 1) the industry is expanding manufacturing capacity with an emphasis on value-added processing;
- 2) increased harvests on the Tongass have improved the balance between Forest Service sales of timber and volume under contract with present and emerging markets; and
- 3) increased use of low-volume timber stands is resulting in a faster return of public monies invested in roads and log transfer facilities.

CONTENTS

Executive Summary	ii
Introduction	1
The Role of the Forest Products Industry in the Alaskan Economy	3
Alaska as an Exporter	3
Output of Alaska's Forest Products Industry	4
Structure of the Industry	5
Role of the Forest Products Industry in Southeast Alaska's Development	5
Employment in the Forest Products Industry	6
Timber Supply	11
Forest Service Contributions to Timber Supply	12
Alaska's Markets for Forest Products	15
Alaska's Log and Lumber Markets	16
Dissolving Pulp--Alaskan Producers Benefit From a Global Shakeout	
Which Narrows the Field of Competitors	19
<i>Recent Market Trends</i>	19
<i>Trends in the use of manufactured fiber</i>	23
<i>Outlook for consumption of dissolving pulp from Alaska</i>	25
Demand for Pulpwood in the Pacific Rim is Projected to Increase	26
Financial Analysis of the Tongass Timber Sale Program and the Economic Impacts of the Timber Sale Program on Southeast Alaska	29
Conclusion	35
References	37

LIST OF TABLES

1. International exports of Alaskan forest products, fiscal years 1981-89	4
2. Southeast Alaska lumber and wood products employment, harvest volume and population, fiscal years 1980-1989	6
3. Timber supply in southeast and southcentral Alaska, harvest and import by source and type of timber, fiscal years 1981-1989	10
4. Volume of timber prepared, offered, sold and harvested on the Tongass National Forest, fiscal years 1987-1989	12
5. The value of Alaskan log exports increased by 18 percent in fiscal year 1989, value by destination by fiscal year	16
6. Volume and average value of log exports by port, species and destination Anchorage Customs District, fiscal year 1989	17
7. In fiscal year 1989, Alaskan pulp was exported to 18 foreign countries	20
8. Continued growth in Japanese pulpwood consumption tightened the Pacific Rim market for wood fiber	26
9. Timber Sale Program Information Reporting System, Report 1 Statement of revenues and expenses	32
10. Timber Sale Program Information Reporting System, Report 2 The economic account	33
11. Timber Sale Program Information Reporting System, Report 3 Employment, income and program level account	34

LIST OF FIGURES

1. Value of international exports of Alaskan forest products	ii
2. In 1989, forest products were 24.8 percent of the value of Alaskan exports	3
3. Government is the largest employer in Southeast Alaska and the manufacturing, trade and service sectors have a smaller share of employment than found in the United States	7
4. Dependence on exports makes Alaska and the Southeast Region vulnerable to wide fluctuations in economic output...and the dependence is widely understood in the local communities	8
5. Seasonality of employment varies among communities depending on each community's economic base	9
6. Private landowners provided almost 57 percent of the harvest in Southeast Alaska in fiscal year 1989	11
7. Strong markets and adjustments in timber sale offerings continue to improve the balance among volume offered, sold/released and harvested on the Tongass National Forest	13
8. International exports of Alaskan forest products by major importing countries	15
9. Exports of logs and sawnwood increased for the fifth straight year	18
10. Market prices for Alaska's pulp exports in foreign markets have increased 77 percent since 1985	19
11. In 1989, the United States had about 26 percent of the world's capacity to produce dissolving wood pulp	22
12. World capacity to produce dissolving pulp declined between 1985 and 1989 while consumption in 1988 was almost equal to consumption in 1970	22
13. The U.S.S.R. is the biggest producer and consumer of rayon and acetate	24

INTRODUCTION

In Southeast Alaska, the forest products industry harvests and processes timber principally to meet the demand for wood products in Pacific Rim countries. The quantity of timber harvested and processed in Alaska each year depends on the industry's international competitiveness. Alaska's competitiveness abroad depends on resource supply in Alaska and overseas, demand for the product in the Pacific Rim, and finally, the competitiveness of the United States dollar with other currencies. This report estimates timber harvest in Southeast and Southcentral Alaska during fiscal year 1989 and describes the market conditions affecting the State's forest products industry.

First, the role of the forest products industry in the Alaskan economy is discussed. Emphasis is given to Alaska's role as an exporter to the Pacific Rim. The output of the forest products industry in Southeast Alaska in recent years is reported and the structure of the industry is discussed. The role played by the forest products industry in Southeast Alaska's economic development is highlighted and a report on the employment in the sector is presented.

Second, timber harvests in Southeast and Southcentral Alaska from Forest Service, Native corporations, State of Alaska, and other ownerships are estimated and displayed for the period 1981 to 1989. Imports of roundwood and chips are reported to complete the picture of raw material available to the forest products industry. The National Forest timber volumes offered for sale, sold and harvested over the last few years are summarized.

Third, this report describes Alaska's principal markets for forest products. Noted are factors affecting Alaska's markets for softwood logs and lumber, as well as shifts in the global market which are altering the role of Alaska's dissolving pulp manufacturers. Provided next is a more detailed analysis of the dissolving pulp market. Dissolving pulp producers are the major consumers of timber from the Tongass National Forest.

Finally, a financial analysis of the Tongass timber sale program is presented along with a display of the program's economic impacts on Southeast Alaska.

THE ROLE OF THE FOREST PRODUCTS INDUSTRY IN THE ALASKAN ECONOMY

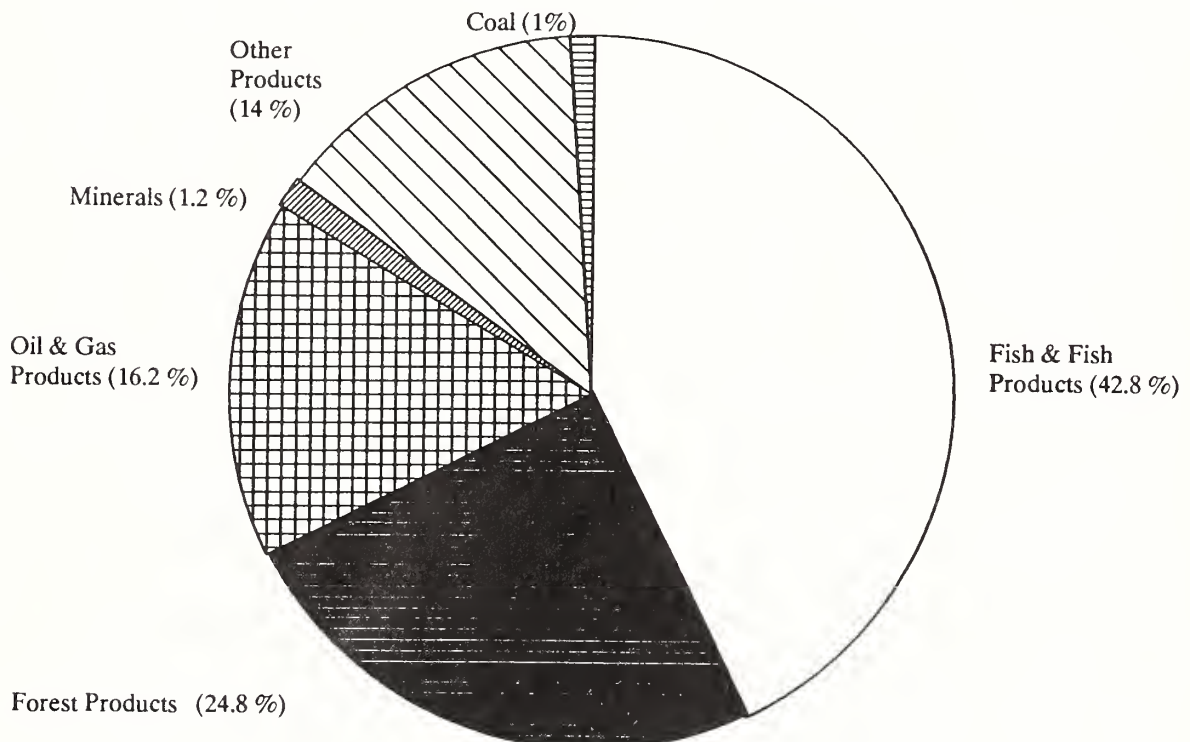
Alaska as an Exporter

The output of the Alaskan economy is dominated by the foreign export of fishery and forestry products, the sale of North Slope oil to the coterminus States, and the accommodation of foreign visitors and domestic tourists. The dollar value of total output of good and services from Alaska in 1986 was \$19.6 billion. Merchandise exports comprised \$1.3 billion or 6.6 percent of this output (US Dept of Commerce). By comparison, total output in the United States in 1986 was valued at \$4.2 trillion, merchandise exports were \$227 billion or 5.4 percent. In 1989, merchandise exports from Alaska exceeded \$2.5 billion.

The value of forest products exports from Alaska have tripled over the last four years, rising from \$204.5 million in 1985 to more than \$612 million in fiscal year 1989. Forest products exports were the second largest exporting sector from Alaska in fiscal year 1989 representing 24.8 percent of total export earnings (figure 2). In value, Alaska's international exports in 1989 were led by fishery products (42.8 percent), wood products (24.8 percent), oil & gas (16.2 percent), minerals (1.2 percent), coal (1.0 percent) and other products (14.0 percent).

Figure 2. In 1989, forest products were 24.8 percent of the value of Alaskan exports.

Value of Alaskan Exports in 1989
(Percent Distribution)



Output of Alaska's Forest Products Industry

The forest products industry in Alaska produces logs, dissolving pulp, lumber and wood chips for exports. Most of the industry is concentrated in Southeast Alaska. Currently, five sawmills and a number of small portable mills in Southeast Alaska produce lumber for export. In addition, two pulpmills in Southeast Alaska produce dissolving pulp for both domestic and foreign markets. Alaska's dissolving pulp, produced from wood fiber, is a basic ingredient for rayon, cellophane and other specialized industrial and aerospace materials.

In addition to supplying domestic processors, Alaska's forest products industry exports high-quality pulp products which are competitive worldwide. In fiscal year 1989, Alaskan manufacturers exported \$227 million in pulp products to 18 countries in Asia, Europe and Latin America. The major markets for Alaska's output of softwood logs, cants and lumber in fiscal year 1989 were Japan, South Korea, Canada, China and

Taiwan. Log exports were valued at more than \$310 million and the value of lumber shipped abroad in fiscal year 1989 exceeded \$71 million (table 1).

In each product and foreign market, Alaskan manufacturers must compete with softwood producers from the Pacific Northwest, British Columbia, the Soviet Union, New Zealand and Chile. In a variety of structural and decorative end-uses, Alaskan lumber manufacturers must also compete with hardwood suppliers spread throughout Southeast Asia.

Japan remains the largest importer of softwood products outside North America. In fiscal year 1988, Japan imported 48 percent of the value of Alaskan pulp exports, 81 percent of the value of log exports and 93 percent of the value of lumber exports. The good export market for forest products has tightened log supplies sufficiently that Alaskan producers are finding markets for pulp-grade logs in British Columbia.

Table 1. International exports of Alaskan forest products fiscal years 1981-89

Product/Unit ¹	1981	1982	1983	1984	1985	1986	1987	1988	1989
Softwood Logs									
Volume (MMBF)	130.1	197.5	292.6	237.6	258.6	340.3	436.1	482.2	629.6
Value (\$millions)	68.4	95.4	128.3	97.1	99.6	137.9	179.6	261.6	310.3
Unit Value \$/MBF	526	483	439	408	385	405	412	543	493
Lumber and Cants									
Volume (MMBF)	202.5	178.6	136.0	113.3	122.0	93.5	121.0	152.5	182.3
Value (\$millions)	60.3	62.5	45.5	32.2	32.5	24.7	33.9	52.1	71.0
Unit Value \$/MBF	298	350	334	284	266	264	280	342	389
Woodchips									
Volume (Mton)	60.5	84.8	19.0	10.5	4.5	0.0	0.0	10.4	77.9
Value (\$millions)	5.5	6.4	1.3	0.3	0.4	0.0	0.0	0.6	3.6
Unit Value \$/ton	90	75	66	32	98	0.0	0.0	54	46
Woodpulp									
Volume (Mton)	252.9	211.0	188.5	249.2	166.5	203.8	232.0	260.4	296.9
Value (\$millions)	135.7	113.3	94.8	127.3	72.0	85.4	113.9	160.4	227.7
Unit Value \$/ton	537	601	503	510	433	419	492	616	767
TOTAL VALUE (\$millions)	269.9	277.6	269.9	256.9	204.5	248.0	327.4	474.7	612.7

^{1/} Volumes exported are reported as millions of board feet (MMBF) or thousands of metric tons (Mton). Woodpulp is exported dried, in sheets or rolls, therefore, the tonnage reported is the dry weight of the product shipped. Values are free along ship (FAS) in millions of nominal dollars. Unit values are dollars per unit.

Source: Compiled from official statistics of the U.S. Department of Commerce (1990).

Over the last three years, markets in the Pacific Northwest have been established for Alaskan timber products. In addition, producers of semi-finished products (such as cants) have shifted some production to surfaced lumber cut to metric dimensions for the Japanese construction markets. Penetration into these markets characterize the industry's thrust to diversify and produce higher value-added products.

Structure of the Industry

Two major facilities produce dissolving pulp in Southeast Alaska: The Alaska Pulp Corporation mill (APC) in Sitka and the Ketchikan Pulp Company mill (KPC) near Ketchikan. In fiscal year 1989, the two pulpmills operated near their maximum capacity producing just under 400 thousand short tons. Operating rates are expressed as the ratio of actual annual production to total production capacity. At capacity, the consumption of logs and residuals from sawmills is approximately 400 MMBF per year. Operating at full capacity and increasing demand for dissolving pulp has motivated these firms to complete major improvements and expansions in their facilities.

The capacity to produce lumber in the sawmill industry increased from roughly 370 MMBF in fiscal year 1988 to about 470 MMBF per annum in fiscal year 1989. The lumber producers include APC - Wrangell Forest Products in Wrangell, the Annette Hemlock mill (a joint operation between the Annette Indian Reservation and KPC) in Metlakatla, the Chilkoot Lumber Company in Haines, Klawock Timber Alaska, Inc. in Klawock and the newest addition, the Ketchikan Pulp Company sawmill adjacent to its pulp facility in Ketchikan. About 9 smaller mills operate intermittently with a combined annual capacity of 36 MMBF. The average individual production level for the smaller processors is normally less than 1 MMBF of softwood logs.

Role of the Forest Products Industry in Southeast Alaska's Development

Historically, the forest products industry in Southeast Alaska stems from the joint efforts of the Federal Government and the Territory of Alaska to promote greater economic stability in the region.

"During the 1940's the region's economic base was all but wiped out. Gold mining was terminated in 1942. After decades of serious overexploitation, the salmon resource crashed -- average annual salmon harvests declined from 31 million fish in 1945-49 to 19 million fish in 1950-1976 and bottomed out at 8 million fish for 1977-79.

The creation of the new forest products industry in 1954, therefore, was something of a rescue mission for the region's economy. The provisions of the fifty year contracts guaranteeing timber supply were essential to induce the substantial private investment required. The initial investment in the two mills was over one hundred million dollars and further substantial investments were made for increasing capacity and modifying the processes. This made it the largest private investment in Alaska since the Morgan-Guggenhiem investment in copper and a railroad in the first decade of the century. (Rogers, 1989)"

The USDA Forest Service became active in the region's development because of its role in administering the Tongass National Forest. Before statehood, most of Southeast Alaska, outside of the incorporated cities, was part of the Tongass. Forest Service administration of the Tongass National Forest coupled with private investment yielded two pulp mills and a number of sawmills scattered throughout Southeast Alaska. The Alaska Native Claims Settlement Act of 1971 (ANCSA) and the Alaska Statehood Act influenced the evolution of the forest products industry by creating a number of new forest ownerships. The current level of timber harvest and processing activities in the region reflect growing opportunities to market forest products in Pacific Rim countries and the management policies of the USDA Forest Service and the State of Alaska.

Under ANCSA, 13 private corporations were created in Southeast Alaska. These corporations are entitled to a conveyance from the federal government in excess of 600,000 acres in Southeast Alaska. Roughly 80-85 percent of this land, most of which is forested, has been conveyed. Much of this private timber is being harvested and exported as logs. Some of the residual low-value logs are sold to the two pulpmills.

Employment in the Forest Products Industry

Employment in the forest products industry has increased in every year since 1986 (table 2). For several reasons, the role of forest products employment in the regional economy is noteworthy. First, it helps to offset the region's heavy reliance on public sector employment. Second,

forest products employment helps to maintain continuity in private sector employment. Specifically, the local processing of timber increases the length of the work-year for a number of the local communities beyond the May-September season for fishing and tourism.

Table 2. Southeast Alaska lumber and wood products Industry employment and harvest volume, fiscal years 1980-89.

Employment ¹	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Logging	1141	1047	991	1010	946	1004	1239	1545	1981	2113
Sawmills	785	605	540	429	395	363	331	375	468	478
Pulpmills	1023	1081	975	854	700	580	772	861	892	925
Total Direct Employment	2949	2733	2506	2293	2041	1947	2342	2790	3341	3516
Indirect and Induced ² Employment	2300	2125	1950	1800	1600	1500	1825	1950	2350	2550
TOTAL ³	5249	4858	4456	4093	3641	3447	4167	4740	5691	6066
Harvest volume ⁴ (MMBF)	670.7	497.8	558.7	565.9	534.8	507.8	596.6	748.5	817.5	1078.1

1/ Alaska Department of Labor statistics subject to revision. Current as of April 5, 1990.

2/ Rounded to the nearest 25 jobs. Data reflect the impact of money re-circulating through the economy and are estimated from a Forest Service input-output simulation model, IPASS, for Southeast Alaska. The IPASS model was developed by the Pacific Northwest Forest and Range Experiment Station in cooperation with the University of Minnesota. Revisions from prior 706(a) reports reflect an updated data base and calibrations to fiscal year 1988 using employment and earnings estimates made by the Alaska Department of Labor. The Forest Service has contracted with the Alaska Department of Labor to provide detailed estimates of earnings and employment by economic sector for Southeast Alaska by fiscal year. This cooperation will allow improved estimation of the indirect and induced earnings and employment effect of the agency's management initiatives and investments. Revisions of the estimated indirect and induced effects displayed in this table are possible as a result of this joint study.

3/ Based on the Timber Sale Program Information Reporting System(TSPIRS), harvest and processing of timber from the Tongass National Forest in fiscal year 1989 supported 2083 of the reported logging, sawmill and pulpmill jobs. Across all economic sectors including forest products, 3859 jobs in Southeast Alaska are affected by timber harvest on the Tongass.

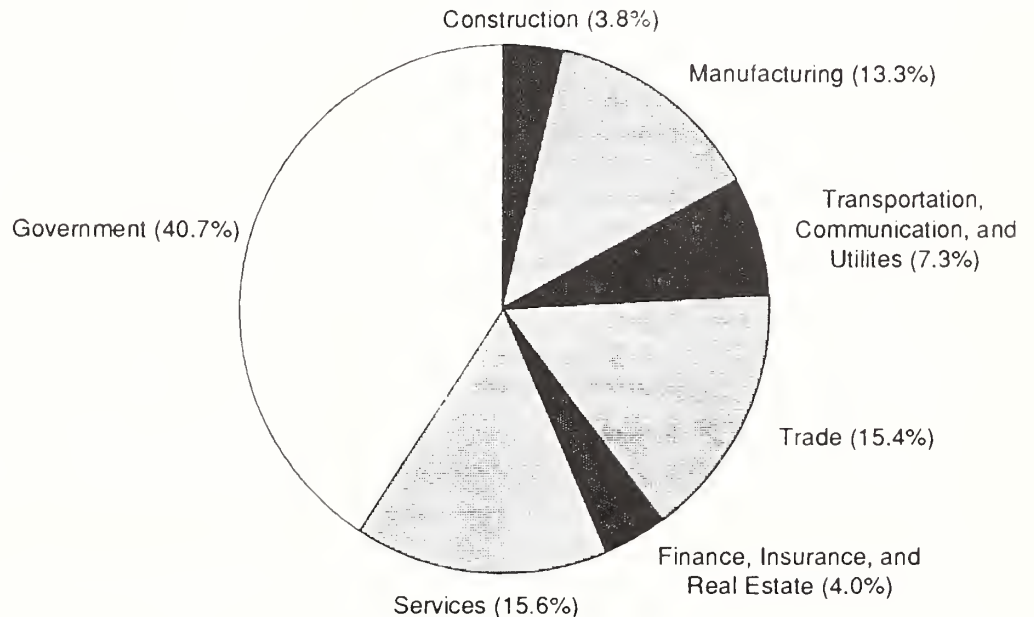
4/ Southeast Alaska. This harvest is from the following: Sawtimber plus utility for Forest Service and State of Alaska; BIA volume; Export logs and pulp logs for private firms in the Southeast Alaska for fiscal years 83-86 overstate the total harvest by the volume of export sawlogs shipped from Southcentral Alaska. Data were not yet found to specify this flow.

Source: Alaska Department of Labor and USDA-Forest Service, Alaska Region.

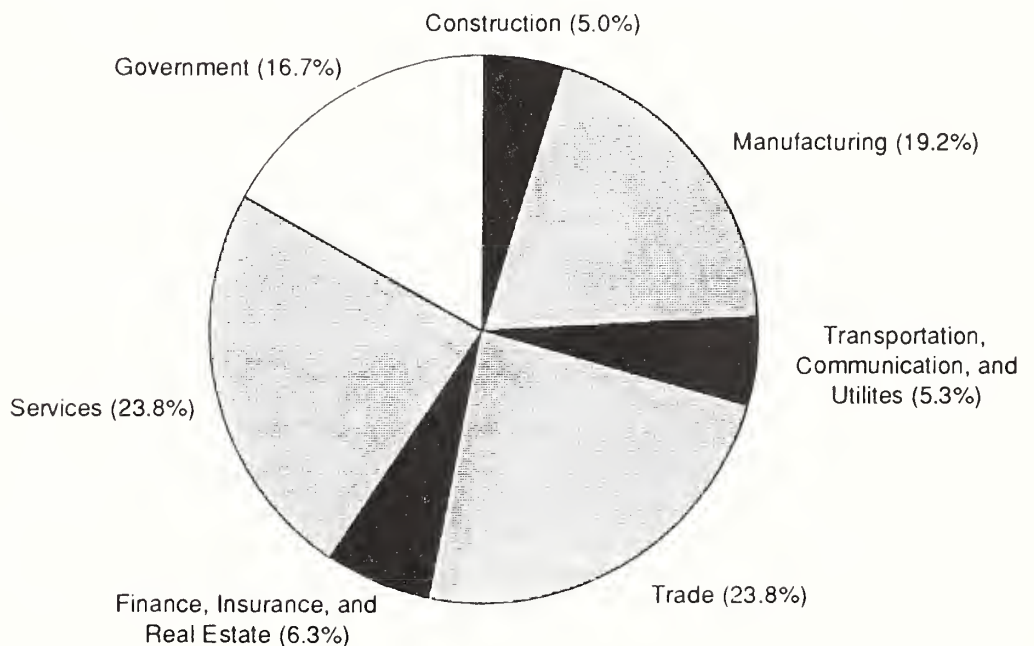
Figure 3. Government is the largest employer in Southeast Alaska and the manufacturing, trade and service sectors have a smaller share of employment than found in the United States.

Employment In Southeast Alaska compared to total employment in the United States.

Southeast Alaska



United States



SOURCE: 1986 employment data from Alaska Department of Labor, Research Analysis Section. 1987. Statistical Quarterly, Fourth Quarter, 1986. Computations by EIS staff.

In general, the share of government in total employment in Southeast Alaska is much greater than found in comparison to total employment in the United States and the role of manufacturing, construction, trade and services is much smaller in Southeast Alaska (figure 3).

The public sector has a significant presence in the region. State and local government in Southeast Alaska provided an equivalent of 9,950 full-time jobs in 1989. Employment in State and local government is heavily influenced by the level of oil royalties returned to the State from leases of off-shore tracts on the North Slope and the flow of oil through the trans-Alaska pipeline. With the capital of Alaska in Juneau, the effects of changes in employment and earnings in State and local governments are pronounced.

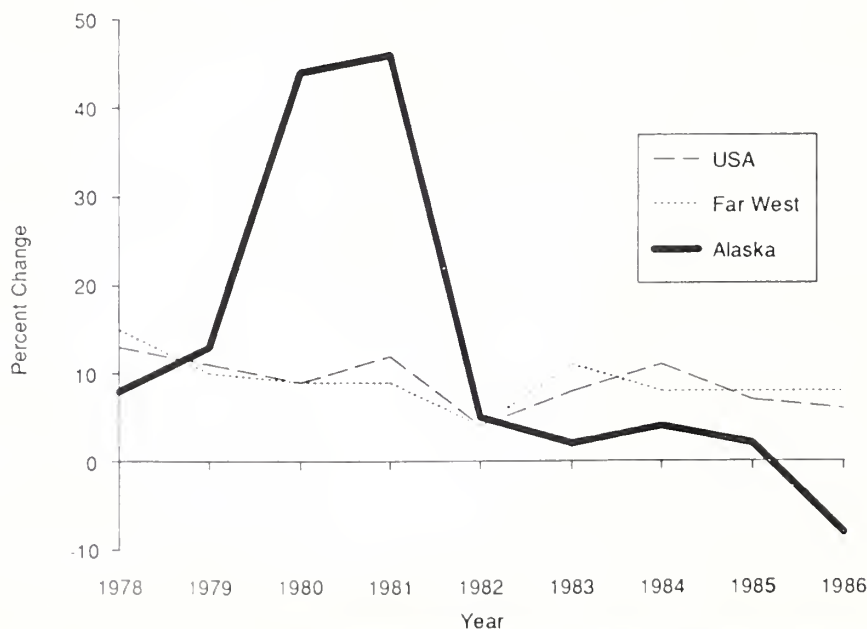
The federal government is also an important employer in Southeast Alaska. Averaging 2050 employees in 1989, the federal sector represents approximately 7 percent of Southeast Alaska's total wage and salary employment of 32,200. The Forest Service employs roughly one-third of the federal workers in Southeast Alaska. Forest Serv-

ice employment is influenced by the level of federal appropriations, particularly the Tongass Timber Supply Fund. Changes in Forest Service employment could have pronounced effects on the regional economy.

As mentioned, the dependence on export of natural resources makes Alaska and the Southeast region vulnerable to global economic events. For example, figure 4 shows Gross State Product for the United States, the Far West (California, Nevada, Oregon, Washington, Alaska and Hawaii) and Alaska as defined by the US Dept of Commerce, Bureau of Economic Analysis. The percent change from year to year is calculated. The reaction of the Alaskan economy to the rise in oil prices from 1978-1982 is apparent, as the value of Alaska's economic output grew faster than the United States or the Far West. In 1983, the sharply rising dollar began cutting deeply into the competitiveness of Alaskan exports of natural resources. By 1986 the precipitous fall in the price of crude oil and the rise in the value of the dollar decimated Alaskan exports and Gross State Product contracted.

Figure 4. Dependence on exports makes Alaska and the Southeast Region vulnerable to wide fluctuations in economic output ... and the dependence is widely understood in the local communities.

Change in Gross State Product for Alaska, the Far West region and the United States, 1978-1986.

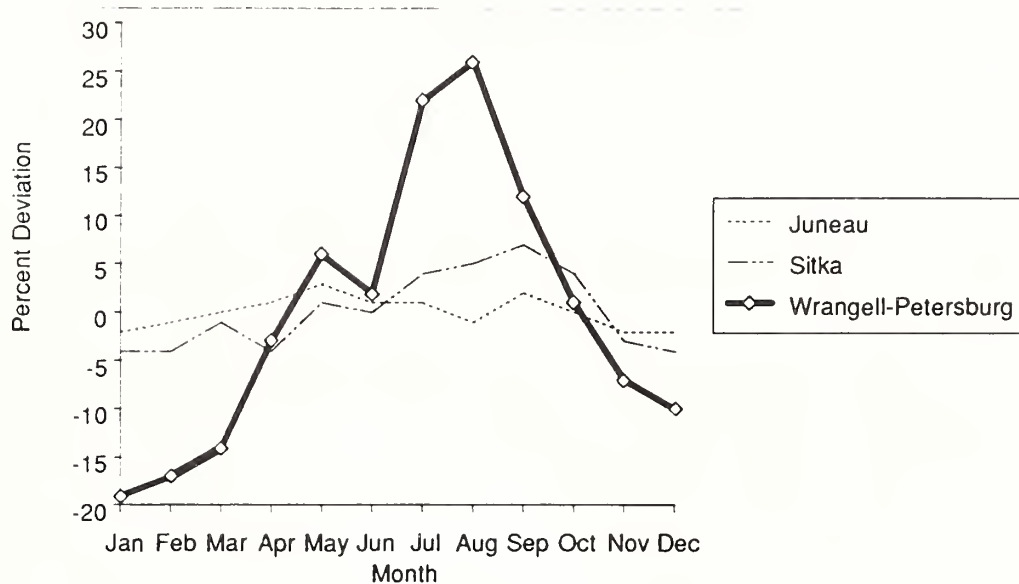


The dependence of the region's economy on foreign demand is widely understood in the local communities. This economic vulnerability heightens the desire both to broaden the base of economic activity and to stabilize the existing jobs through a continuity of resource supply. Note that the employment fluctuation extends not only over the business cycle but also there is much greater change over the year among communi-

ties based on their economic orientation. Juneau, for example, with its base in government, experiences little annual variation. Sitka, with employment led by the pulp mill, experiences slightly more annual change. In several other census areas such as Wrangell-Petersburg, communities focused on logging and fishing face still more variation in employment than Sitka (figure 5).

Figure 5. Seasonality of employment varies among communities depending on each community's economic base.

Seasonality of Employment in Selected Southeast Alaska Communities, 1987.



SOURCE: Alaska Department of Labor, Research and Analysis Section. 1987. Statistical Quarterly, Fourth Quarter.

*Table 3. Timber supply in southeast and southcentral Alaska
Harvest and import by source and type of timber, fiscal years 1981-1989 ^{1/}*

	1981	1982	1983	1984	1985	1986	1987	1988	1989
(In million board feet, log scale)									
Southeast									
Public									
Tongass N.F.									
Sawtimber	339.5	326.6	220.0	226.7	162.5	251.4	282.0	331.5	377.0
Utility ^{2/}	47.8	43.8	30.0	34.0	69.5	39.1	54.2	64.7	67.6
State of Alaska									
Sawtimber	38.1	26.2	20.9	14.3	3.3	10.4	16.1	13.5	13.5
Utility	0.7	0.0	0.1	0.5	0.5	0.2	0.3	0.1	0.1
BIA ^{3/}	4.7	2.8	3.1	1.1	0.1	0.0	0.0	0.0	3.5
Private^{3/}									
Export Sawlogs	31.6	137.0	249.3	202.3	225.3	295.9	286.1	286.4	419.8
Pulplogs	57.6	19.6	54.3	88.0	61.0	58.8	124.8	121.3	192.9
SE AK Sawlog Harvest	413.9	492.6	493.3	444.4	391.2	557.7	584.0	625.2	813.8
SE AK Total Harvest	520.0	555.9	577.7	566.9	522.2	655.9	763.3	811.3	1074.4
Imports									
Sawlogs	27.1	3.1	21.1	5.7	7.8	24.4	5.7	0.1	1.8
Pulpwood logs	0.0	0.0	2.0	38.0	11.9	22.1	5.1	6.8	1.9
Wood chips ^{4/}	0.0	0.0	0.0	15.6	0.0	0.0	0.0	0.0	0.0
SE AK Wood Supply	547.1	559.0	600.8	626.2	541.9	702.4	774.1	818.2	1078.1
Southcentral									
Public									
Chugach N.F.	1.8	0.4	1.1	0.5	0.7	0.8	0.7	1.0	1.1
State of Alaska									
Sawtimber	13.2	1.4	0.8	0.8	0.5	1.0	1.1	0.5	0.5
Utility	2.6	0.8	27.8	2.3	1.8	0.8	0.8	1.6	1.6
Private									
Export Sawlogs	18.5	21.2	ne	ne	ne	ne	44.2	79.2	120.0
Pulplogs	ne	ne	ne	ne	ne	ne	0.0	6.4	0.0
Southeast and Southcentral Alaska									
Harvest Sawtimber	447.4	515.6	495.2	445.7	392.4	559.5	630.0	705.9	934.5
Harvest Total	556.1	579.7	607.4	570.5	525.2	658.5	810.1	900.0	1198.0
Wood Supply	583.2	582.8	630.5	629.8	544.9	705.5	820.9	906.9	1201.7

1/ The federal fiscal year extends from October 1st to September 30th of the following year.

2/ The Forest Service requires the harvest and removal of utility volume which is in addition to the 450 MMBF Allowable Sale Quantity (ASQ) calculated in the Tongass Land Management Plan (TLMP). The 450 MMBF Allowable Sale Quantity is based on net sawlog volume, whereas, the timber supply of 4.5 billion board feet per decade specified in Section 705 of the Alaska National Interest Lands Conservation Act (ANILCA) is nonspecific. It is assumed the Section 705 provisions are net of utility volume since the Congressional Record on ANILCA references the ASQ calculations in TLMP.

3/ Estimate. Sources were not found for certain years or ownerships and are not estimated (ne). Some of the private harvest reported in fiscal years 1982-86 for southeast Alaska originated from southcentral Alaska, but data were not available to separate the two regions from the estimated total.

4/ Compiled from official statistics of the U.S. Department of Commerce. Commerce reports pulpwood imports and wood chips imports in short tons. Cords are converted to log scale at a ratio of 2 cords per thousand board feet (MBF). Wood chips are converted to log scale at a ratio of 2.7 short tons per MBF.

TIMBER SUPPLY

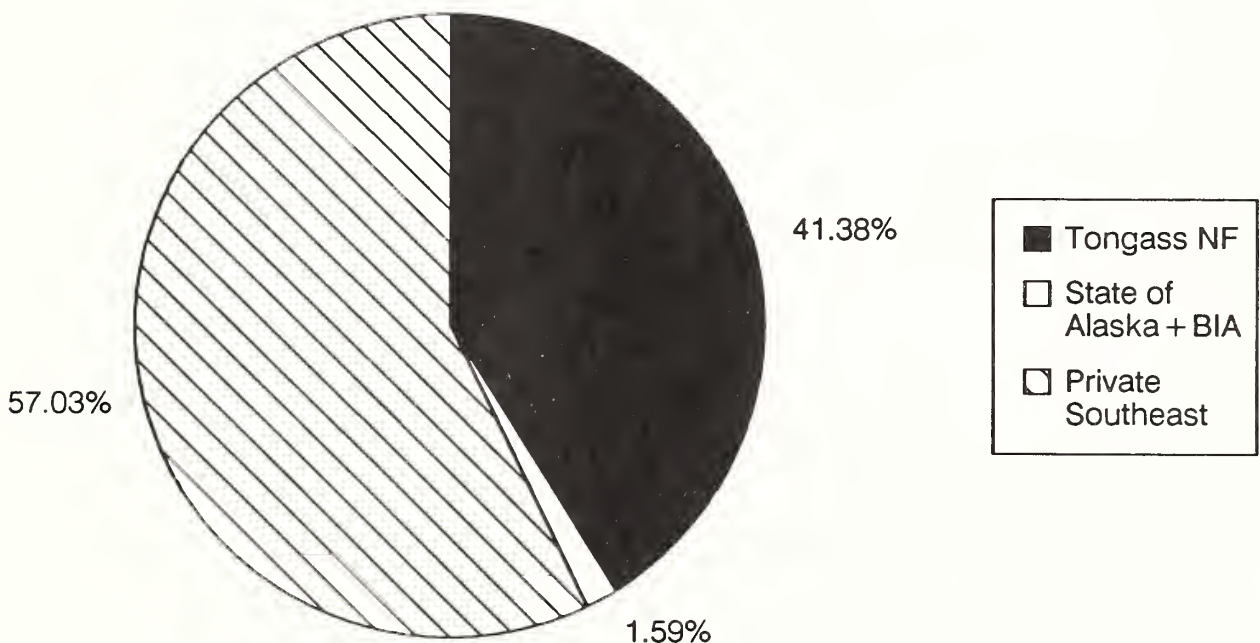
The forest products industry in Southeast Alaska has four principal sources of timber: forested lands of the Tongass National Forest administered by the USDA Forest Service; timber inventory held by private corporations (principally Alaska Native Corporations formed through ANCSA); timber sales of the State of Alaska; and imported logs and chips (table 3). Federal timber is used to make dimension lumber and dissolving pulp. Some of the western redcedar and Alaskan yellow cedar harvested on Federally-administered land is sold (under exemption) as logs for export. Timber from private and State land is exported as logs or sold to local pulpmills.

National Forest timber harvest in fiscal year 1989 increased 12 percent over 1988. Timber-sale operators harvested 377.0 MMBF of sawtimber from the Tongass National Forest. An additional 67.6 MMBF in utility volume was taken yielding a total harvest of 444.6 MMBF from the Tongass.

Private corporations (Southeast Alaska Native corporations organized under ANSCA) have steadily increased their share of the total Southeast Alaska timber harvest; from 17 percent in fiscal year 1981 to almost 57 percent in fiscal year 1989. During 1989 the sawlog harvest from private lands in Alaska was approximately 540 MMBF and the pulplog harvest roughly 193 MMBF. The saw timber harvest for fiscal year 1989 is estimated at 419.8 MMBF from private land in Southeast Alaska and 120 MMBF from private land in Southcentral Alaska. Pulplog harvest from private land this year is estimated at 192.9 MMBF from Southeast Alaska.

Table 3 reports estimated harvest by ownership or management authority for fiscal years 1981-89. Figure 6 shows the distribution of harvest in Southeast Alaska by ownership or managing agency for fiscal year 1989.

Figure 6. Private landowners provided almost 57 percent of the harvest in Southeast Alaska in fiscal year 1989.



Forest Service Contributions to Timber Supply

The Forest Service adjusts its timber sale offerings and road construction in response to the anticipated demand for forest products from Alaska's trading partners in the Pacific Basin. The objective of the timber sale program on the Tongass is to balance timber supply with the anticipated needs of purchasers, including the construction of public roads and facilities. The balance is never perfect because of the time it takes to prepare timber for harvest. Typically, it requires 3 to 7 years of staff and contractor effort from when a timber sale is initially designed to when harvest begins.

Harvest in fiscal year 1989 increased 12 percent over last year. The volume under contract plus volume remaining in the long-term sale operating plans increased with the addition of volume prepared under the 1989-94 operat-

ing plan for the Ketchikan Pulp Company (table 4). Stronger markets and adjustments in timber sale offerings continued to improve the balance among volume offered, sold/released and harvested in fiscal year 1989 over prior years (figure 3).

The current policy for future timber sales is to base offerings on harvest levels for the previous year with adjustments for anticipated changes in the market for forest products. Roads are designed and constructed just in time to execute timber harvest.

An Allowable Sale Quantity (ASQ) of 4.5 BBF/decade from the Tongass National Forest was calculated in the Forest Plan. The Forest's ability to supply this volume has been verified, given land status changes, timber harvests to date and the investments in intensive forestry such as precommercial thinning.

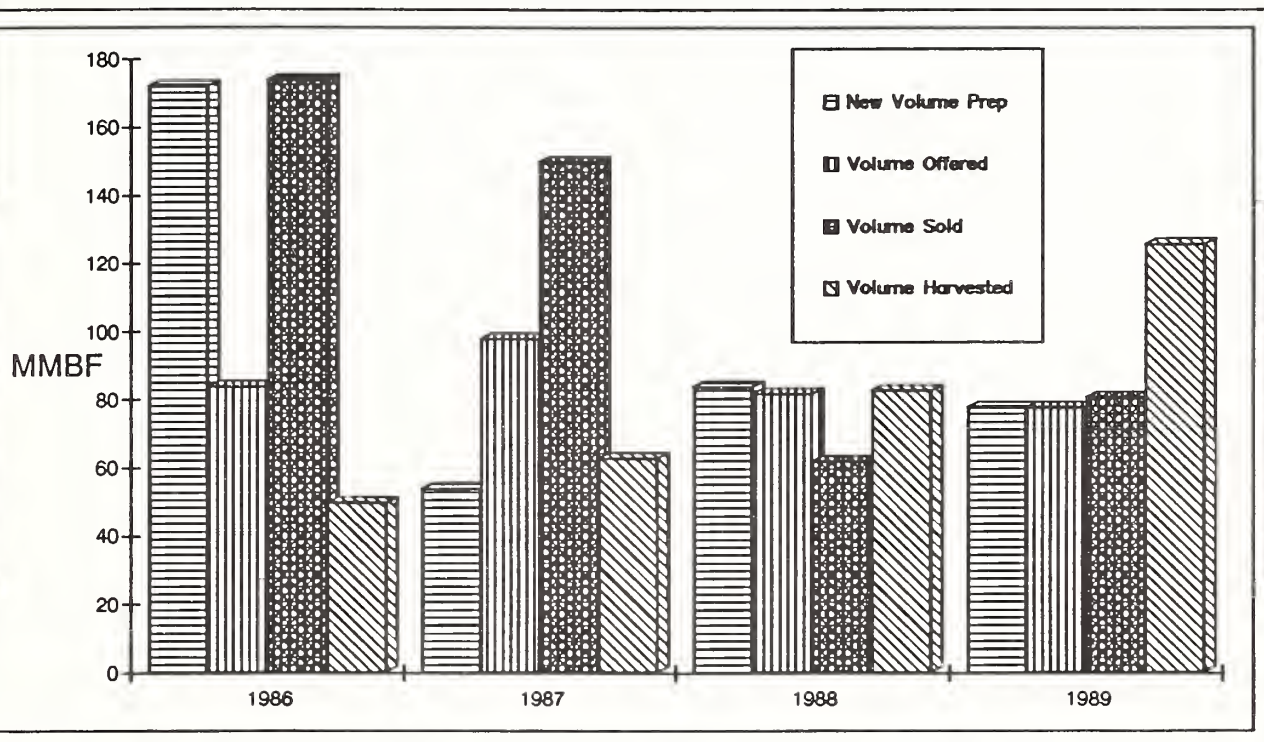
*Table 4. Volume of timber prepared, offered, sold and harvested
on the Tongass National Forest, fiscal years 1987-1989
(all volumes in MMBF, net sawtimber)*

Short-term Sales			
	1987	1988	1989
New Volume Prepared	54	84	78
Volume Offered - New	98	82	78
Volume Sold	150	62	81
Volume Harvested	63	83	126
Volume Uncut Under Contract	483	417	372

Long-term Sales			
	1987	1988	1989
Volume Harvested	219	249	251
Volume Remaining in Operating Plan	1,068	819	1,328

Figure 7. Strong markets and adjustments in timber sale offerings continue to improve the balance among volume offered, sold/released and harvested on the Tongass National Forest.

Short-term timber sales on the Tongass National Forest, fiscal years 1986-89.



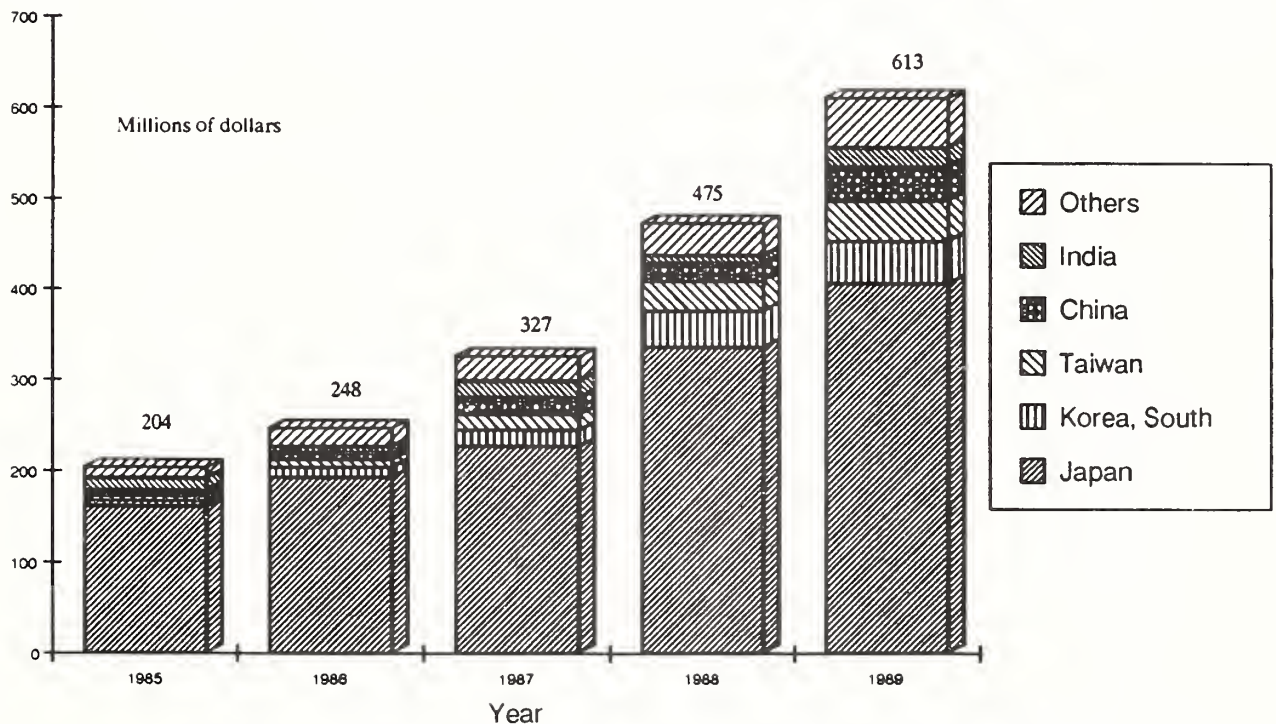
ALASKA'S MARKETS FOR FOREST PRODUCTS

In addition to supplying domestic processors, Alaska's forest products industry exports high-quality lumber and dissolving pulp which are competitive worldwide. In fiscal year 1989, Alaskan manufacturers exported more than \$227 million in pulp products to 18 countries in Asia, Europe and Latin America. The major markets for Alaska's output of softwood logs and lumber in fiscal year 1989 were Japan, South Korea, Canada, Taiwan and China. Log exports exceeded \$310 million and lumber shipped abroad in fiscal year 1989 was valued at more than \$71 million.

In each product and foreign market, Alaskan manufacturers must compete with softwood producers from the Pacific Northwest, British Columbia, the Soviet Union, New Zealand and Chile. In a variety of structural and decorative end-uses, Alaskan lumber manufacturers must also compete with hardwood suppliers spread throughout Southeast Asia.

Japan remains the largest importer of softwood products outside North America. In fiscal year 1989, Japan imported 36 percent of the value of Alaskan pulp exports, 81 percent of the value of log exports and 99 percent of the value of lumber exports (see figure 8).

Figure 8. International exports of Alaskan forest products by major Importing countries.



Alaska's Log and Lumber Markets

The volume and value of Alaska's log exports increased for the fifth straight year in fiscal year 1989 (table 5). Compared to fiscal year 1988, log export volume in fiscal year 1989 grew 18.6 percent and value soared 30.6 percent. The average value per thousand board feet(MBF) eased from the record for Alaskan exports set in 1988 to a still respectable level of \$493 per MBF. Similarly, lumber exports grew for the fourth straight year (figure 9). In comparison to the previous year, fiscal year 1989 lumber export volume from Alaska expanded 36.3 percent, total value jumped 19.5 percent with the value per thousand board feet averaging a new record for Alaskan exports of \$389 per MBF.

This rapid growth in exports stems from the increased competitiveness of the dollar, the continued expansion of the United States and other Pacific Rim economies and constraints elsewhere on softwood supplies of Sitka spruce, tight-grained hemlock and western red-cedar. The good export market for forest products has tightened timber supplies sufficiently

that Alaskan producers are finding markets for pulp-grade logs in British Columbia (table 6).

Increased demand for trans-oceanic containers continues to plague Alaskan producers in their attempt to penetrate Asian lumber markets. Rising freight rates on containers to Asia reflect the success of the United States manufacturers in selling more products abroad. But, the rising freight rates on containers constrain lumber exporters wishing to sell directly to wholesalers and end-users abroad. Southeast Alaskan shippers are impacted further because facilities are not available to fill and load trans-Pacific containers. Containers or other forms of protected storage below deck are necessary to ship planed and dried lumber to avoid damage to the product enroute to Asian ports. Processed lumber from Southeast Alaska destined for Asia must be barged to Seattle or Anchorage and reloaded into transoceanic containers. This additional handling represents a challenge to Southeast Alaskan lumber manufacturers versus coastal producers in British Columbia, Washington and Oregon which are adjacent to container facilities.

*Table 5. The value of Alaskan log exports increased by 18 percent in fiscal year 1989.
Value by destination by fiscal year
(Thousands of dollars)*

Exported to	1985	1986	1987	1988	1989
Australia	0	0	0	35	15
Canada	1,826	1,564	9,840	9,313	8,625
China	745	0	3,775	3,229	3,735
Federal Rep. of Germany	0	0	0	17	0
Israel	0	0	37	0	0
Japan	91,415	126,466	148,887	211,450	252,323
South Korea	5,778	9,625	16,595	33,833	41,315
Taiwan	0	293	549	3,778	4,335
Turkey	0	0	0	246	0
World	99,764	137,948	179,683	261,901	310,348

Note: Compiled from official statistics of the U.S. Department of Commerce.

*Table 6. Volume and average value of log exports by port, species and destination¹,
Anchorage Customs District, fiscal year 1989
Volume in thousand board feet, Scribner scale; value in dollars in thousand board feet*

Port and Species	All countries Volume	All countries Average value	Japan Volume	Japan Average value	China Vol- ume	China Average Value	Korea Vol- ume	Korea Average Value	Canada Volume	Canada Average Value
Anchorage										
Alaska Cedar	90	1,744.79	90	1,744.79	0	0.00	0	0.00	0	0.00
Redcedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Hemlock	33,545	403.50	18,875	482.86	601	360.35	14,069	298.86	0	0.00
Spruce	85,108	500.24	62,873	530.23	11,664	301.67	9,828	504.33	744	1024.95
Other softwoods	382	666.87	382	666.87	0	0.00	0	0.00	0	0.00
All Softwoods	119,125	474.47	82,220	521.32	12,265	304.55	23,897	383.37	744	1024.95
Hardwoods	62	226.50	62	226.50	0	0.00	0	0.00	0	0.00
Dalton Cache										
Alaska Cedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	72	507.03	72	507.03	0	0.00	0	0.00	0	0.00
Hemlock	1,213	333.11	1,213	333.11	0	0.00	0	0.00	0	0.00
Spruce	5,275	421.03	5,275	421.03	0	0.00	0	0.00	0	0.00
Other softwoods	1,909	565.29	1,909	565.29	0	0.00	0	0.00	0	0.00
All Softwoods	8,469	441.68	8,469	441.68	0	0.00	0	0.00	0	0.00
Juneau										
Alaska Cedar	244	901.13	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Hemlock	27,067	424.81	11,692	544.66	0	0.00	11,197	310.43	0	0.00
Spruce	15,073	452.62	14,264	447.91	0	0.00	649	441.56	0	0.00
Other softwoods	2,234	637.56	2,190	627.32	0	0.00	19	705.89	0	0.00
All Softwoods	44,618	447.46	28,146	502.06	0	0.00	11,865	318.24	0	0.00
Hardwoods	49	549.49	0	0.00	0	0.00	38	323.03	0	0.00
Ketchikan										
Alaska Cedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	66,384	416.93	20,653	460.00	0	0.00	31,712	461.59	11,560	202.11
Hemlock	212,004	411.27	154,155	464.70	0	0.00	34,143	299.62	21,720	210.85
Spruce	132,649	664.88	128,066	679.41	0	0.00	31	398.77	3,934	235.91
Other softwoods	31,403	622.77	31,061	627.63	0	0.00	0	0.00	82	200.88
All Softwoods	442,440	503.17	333,935	561.91	0	0.00	65,886	377.63	37,296	210.77
Hardwoods	3	912.47	3	912.47	0	0.00	0	0.00	0	0.00
Skagway										
Alaska Cedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	4	559.25	0	0.00	0	0.00	0	0.00	4	559.25
Hemlock	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Spruce	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other softwoods	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
All Softwoods	4	559.25	0	0.00	0	0.00	0	0.00	4	559.25
Wrangell										
Alaska Cedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	7,338	504.13	730	503.39	0	0.00	6,609	504.20	0	0.00
Hemlock	514	608.57	514	608.57	0	0.00	0	0.00	0	0.00
Spruce	1,227	607.21	1,227	607.21	0	0.00	0	0.00	0	0.00
Other softwoods	3,501	463.23	3,198	475.83	0	0.00	303	376.24	0	0.00
All Softwoods	12,580	507.07	5,669	519.85	0	0.00	6,912	498.59	0	0.00
Valdez										
Alaska Cedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Redcedar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Hemlock	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Spruce	879	398.63	879	398.63	0	0.00	0	0.00	0	0.00
Other softwoods	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
All Softwoods	879	398.63	879	398.63	0	0.00	0	0.00	0	0.00
Total										
Alaska Cedar	334	1128.46	90	1,744.79	0	0.00	0	0.00	0	0.00
Redcedar	73,798	425.69	21,455	461.64	0	0.00	38,321	468.94	11,564	202.24
Hemlock	274,343	411.68	186,449	471.10	601	360.35	59,409	301.48	21,720	210.85
Spruce	240,211	586.61	212,584	611.77	11,664	301.67	10,508	500.14	4,678	361.40
Other softwoods	39,429	607.09	38,740	612.39	0	0.00	322	395.69	82	200.88
All Softwoods	628,115	492.87	459,318	547.93	12,265	304.55	108,560	380.10	38,044	226.72
Hardwoods	114	383.38	65	258.16	0	0.00	38	323.03	0	0.00

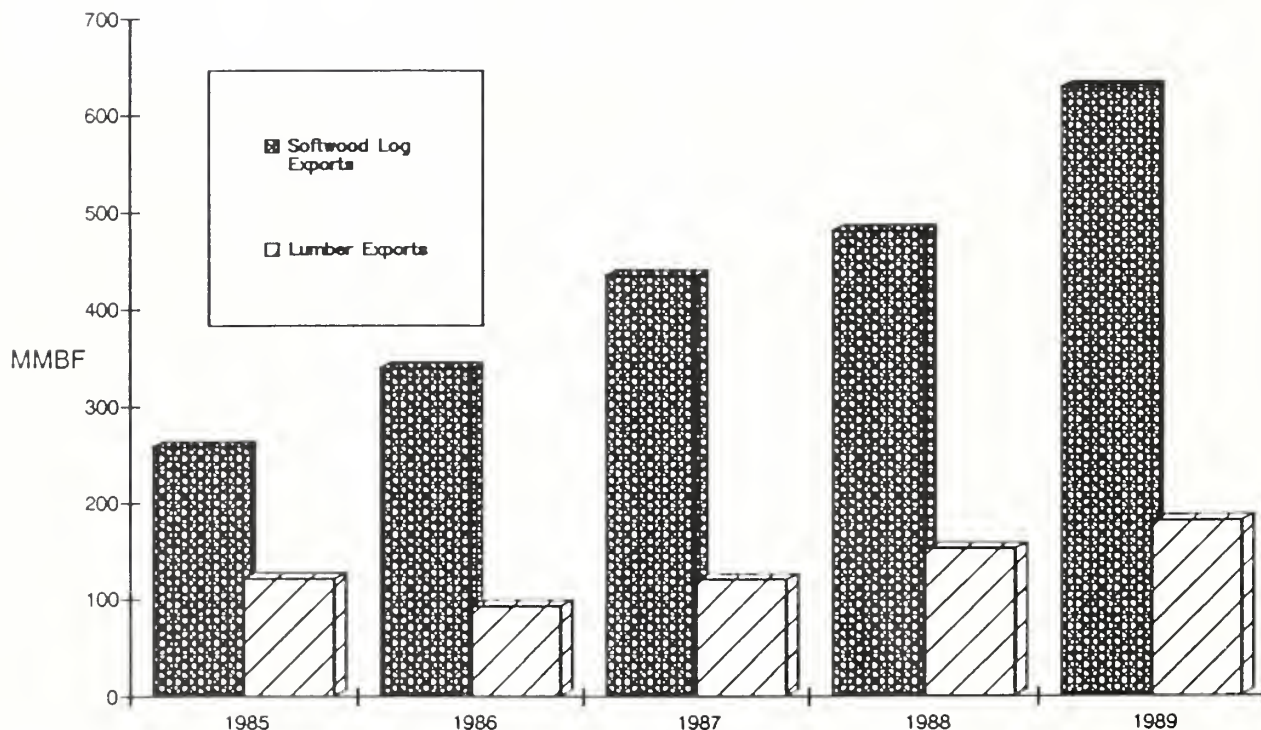
¹ Destinations other than countries listed include Taiwan

Over the next few years, log exports from Southeast Alaska may decline as a number of private landowners complete their harvest of mature stands. In contrast, private landowners in Southcentral Alaska are expected to expand production beyond their fiscal year 1989 export level of 120 MMBF.

Increased penetration of North American softwood lumber into the Japanese, Taiwanese and Korean markets is expected over the next few years. The extent of the gain in sales and the division of shares between producers in the United States and Canada is a function of the macroeconomic and trade policies adopted.

Domestic manufacturers more than doubled the value of lumber exports from the United States to Japan between 1985 and 1989 (USDA Foreign Agricultural Service, 1990). These gains were attributable to shifts in the value of the dollar, successes by North American trade negotiators in reducing tariff and non-tariff barriers and improved marketing. More gains are likely as North American producers' associations have succeeded in presenting evidence to a number of Japanese jurisdictions that three-story wood-frame housing can be built which minimizes fire hazards when building components are correctly installed and maintained.

Figure 9. Exports of logs and sawnwood increased for the fifth straight year.



Dissolving Pulp -- Alaskan Producers Benefit From a Global Shakeout Which Narrows the Field of Competitors

Alaska's pulpmills produce mostly dissolving wood pulp for the rayon staple industry and small amounts of sulfite paper pulp. Most of the wood pulp is exported to the Pacific Rim, Europe and Latin America; a small proportion (10-20 percent) is shipped to markets in the United States. Dissolving pulp is a highly refined, bleached pulp, composed mostly (over 90 percent) of pure cellulose fiber and having other special properties, such as high brightness and uniform molecular weight distribution. It is used for making a wide range of products, including rayon and acetate textile fibers, cellophane, photographic film, and various chemical additives.

In Alaska, dissolving wood pulp is made from softwood fiber by using a sulfite process with a magnesium base, which yields a pulp with a cellulose content of about 91 percent. Most of the pulp produced is of this grade, and

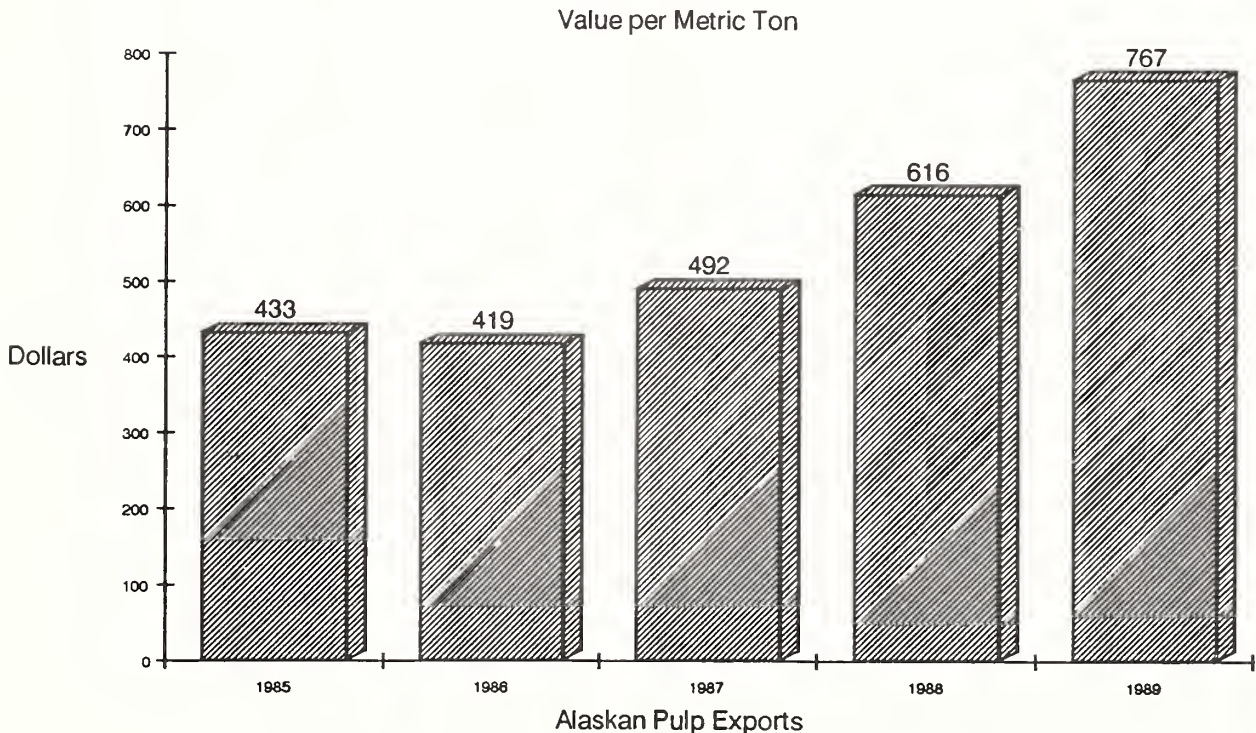
is used for regular-tenacity viscose rayon products, including cellophane. Some of the sulfite pulp is purified further to achieve a cellulose level of 93 percent. This higher grade is sold for high-wet-modulus rayon manufacture and various cellulosic derivatives (Durbak, 1990).

Recent Market Trends

Recent trends indicate a strong current market position for Alaska's dissolving pulp. Between fiscal years 1985 and 1989, the value of pulp exported from Alaska to foreign countries more than tripled jumping from \$72 million to \$227.7 million (table 7).

These sales increases have pushed production to capacity levels. Helped by the demand for paper-grade pulps and their increasing prices, market prices for dissolving pulp in domestic and foreign markets have increased dramatically since 1985 (figure 10). Production incentives at the two Alaskan mills aim at boosting production levels higher to meet the current strong demand.

Figure 10. Market prices for Alaska's pulp exports In foreign markets have increased 77 percent since 1985.



The shifts in Alaska's exports of dissolving pulp to individual markets reflect worldwide trends in dissolving pulp production, consumption, and trade. The share of Alaska's pulp exports going to Japan has been decreasing since 1980, and other markets have gained in relative importance; for example, the share of exports to Europe, India, and Taiwan have increased. Increasing exports to Western Europe and Japan reflect, in part, decreasing production capacity in these markets. Increasing exports to other countries reflect a growing trend in consumption (Durbak, 1990).

The tripling in the value of Alaska's pulp exports from 1985 to 1989 was much greater than the growth in world demand for pulp which grew less than 20 percent over the same period (Pulp & Paper, August 87 and August 89). World production of wood pulp by the sulfate and thermo-mechanical processes expanded dramatically to meet exploding world-wide demand for printing and writing papers. Between 1986 and 2000, wood-based pulp produced by chemical processes is expected to expand 43 percent (FAO, 1988).

*Table 7. In fiscal year 1989, Alaskan pulp was exported to 18 foreign countries
Value by destination by fiscal year
(Thousands of dollars)*

Exported to	1985	1986	1987	1988	1989
Argentina	0	1,326	1,239	1,341	0
Austria	0	0	103	0	0
Bangladesh	0	0	795	0	0
Belgium & Luxem.	1,004	1,725	2,032	1,198	4,307
Bulgaria	0	531	246	0	0
Canada	958	0	0	354	0
China	5,099	7,572	14,436	16,842	33,929
Czechoslovakia	0	0	0	47	302
Egypt	4,850	5,343	3,122	5,621	7,563
France	0	0	0	0	377
Federal Rep. of Germany	456	1,610	931	2,171	3,276
Hong Kong	0	0	372	0	0
Hungary	0	0	0	0	38
India	13,368	6,837	18,401	9,043	21,192
Indonesia	15,337	1,500	3,500	2,433	1,998
Japan	38,010	42,677	45,340	77,010	82,079
South Korea	180	1,103	1,418	3,282	4,684
Netherlands	0	117	112	0	0
Poland	0	0	1,394	4,294	6,780
Soviet Union	0	3,271	4,015	5,247	10,472
Spain	920	1,571	0	1,271	773
Switzerland	0	0	0	0	9
Taiwan	5,311	8,180	16,846	28,880	40,237
Thailand	513	2,210	1,912	2,597	5,859
United Kingdom	0	0	0	0	73
Venezuela	860	0	0	0	0
World	72,041	85,363	113,924	160,397	227,713

Note: Compiled from official statistics of the U.S. Department of Commerce.

Through much of 1989, the pulp and paper industry in the United States operated at full capacity. United States exports of wood pulp grew from 2.2 million metric tons in 1977 to 5.65 million metric tons in 1989. While Alaskan pulp producers manufacture dissolving grades which serve fabric and film manufacturers and not paper producers, they benefit or suffer from any world-wide trend in pulp consumption.

In the production of dissolving pulp, the United States maintains a clear positive balance of trade. In 1989, production in the United States was 1.427 million metric tons. 759 thousand metric tons were exported and imports stood at 162 thousand tons for a net export balance of 597 thousand metric tons (Survey of Current Business, 1990). Worthy of note, total exports from the United States of dissolving pulp for fiscal year 1989 were 782 thousand metric tons. Alaska exported 296.9 thousand metric tons or 38 percent of the gross exports from the United States of dissolving pulp (HS commodity 4702000000).

Over the last decade, declining profits forced a number of less efficient producers of dissolving grades to close production facilities or convert them to making paper grades. The profit decline was due to excess capacity which forced market prices for the dissolving grades at or below sulfite and sulfate paper grades of pulp which are much cheaper to manufacture. World production of dissolving pulp fell from a high in 1978 of 4.87 million metric tons to a low of 4.06 million metric tons in 1982 (FAO, 1988).

From 1982-86, French, Swedish and Japanese producers retired unprofitable capacity. The pruning within the dissolving pulp industry and the subsequent global expansion in pulp demand has bolstered the market position of Alaska's pulp manufacturers. Through fiscal year 1989, Alaska's pulp manufacturers operated at full capacity. Rising product prices have them scrambling for new ways to boost output within the existing production lines.

While Alaskan pulp producers continue to boost output, competing capacity abroad continues to decline due to better business opportunities in the production of market pulp for paper manufacture. A major Brazilian firm has told dissolving pulp customers to find other sources of supply because of a company decision to

double paper pulp production (Pulp & Paper Week, 1988). Other firms in Europe have announced similar plans. Dissolving pulp production capacity in Canada is projected to decline by almost 8 percent between 1989 and 1991 (Pulp and Paper, July 1989).

On the other hand, dissolving pulp capacity has increased during the last decade in India, China, South Africa, Latin America (Durbak, 1990).

In 1989, total world capacity for dissolving pulp production was 5.3 million metric tons (FAO, 1990). This was a notable decrease from previous years, when total capacity was about 6 million metric tons. The decrease was accounted mainly by a sharp drop in capacity in the U.S.S.R. In 1987, the U.S.S.R. had the highest reported dissolving pulp capacity at 1.7 million metric tons, or 29 percent of total world capacity. In 1989, reported capacity in the U.S.S.R. dropped to 760 million metric tons, or 14 percent of the world total. This may be due to some mill closures for environmental reasons.

In 1989, the United States had the capacity to produce 1.36 million metric tons or 26 percent of total world capacity (figure 11). For year the United States has been the world's largest producer of dissolving pulp. For example, it produced 1.2 million metric tons in 1988, or 27 percent of total world production. At 357 thousand metric tons, Alaska's dissolving pulp capacity is about 26 percent of total capacity in the United States and 7 percent of total world capacity. Alaska's dissolving pulp capacity is 27 percent higher than capacity in Canada and 10 percent higher than capacity in Japan (FAO, 1990).

World consumption of dissolving pulp was the same in 1988 as it was in 1970 (figure 12). During this period, dissolving pulp consumption grew generally between 1970-74, 1978-80, and 1982-88 while falling precipitously between 1980-1982. During this period there was a regional shift in consumption as rayon manufacture migrated to lower cost countries. The United States, Japan, and Western Europe reduced production while production has been increasing in the U.S.S.R., South Africa, India, and Latin America.

Figure 11. In 1989, the United States had about 26 percent of the world's capacity to produce dissolving wood pulp.

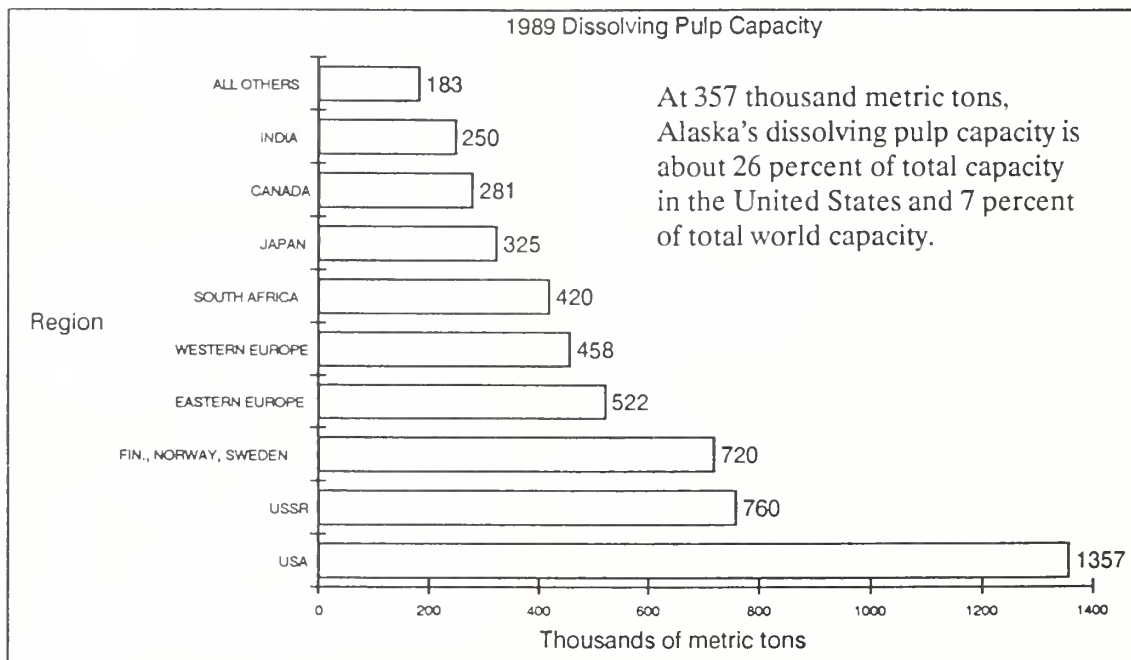
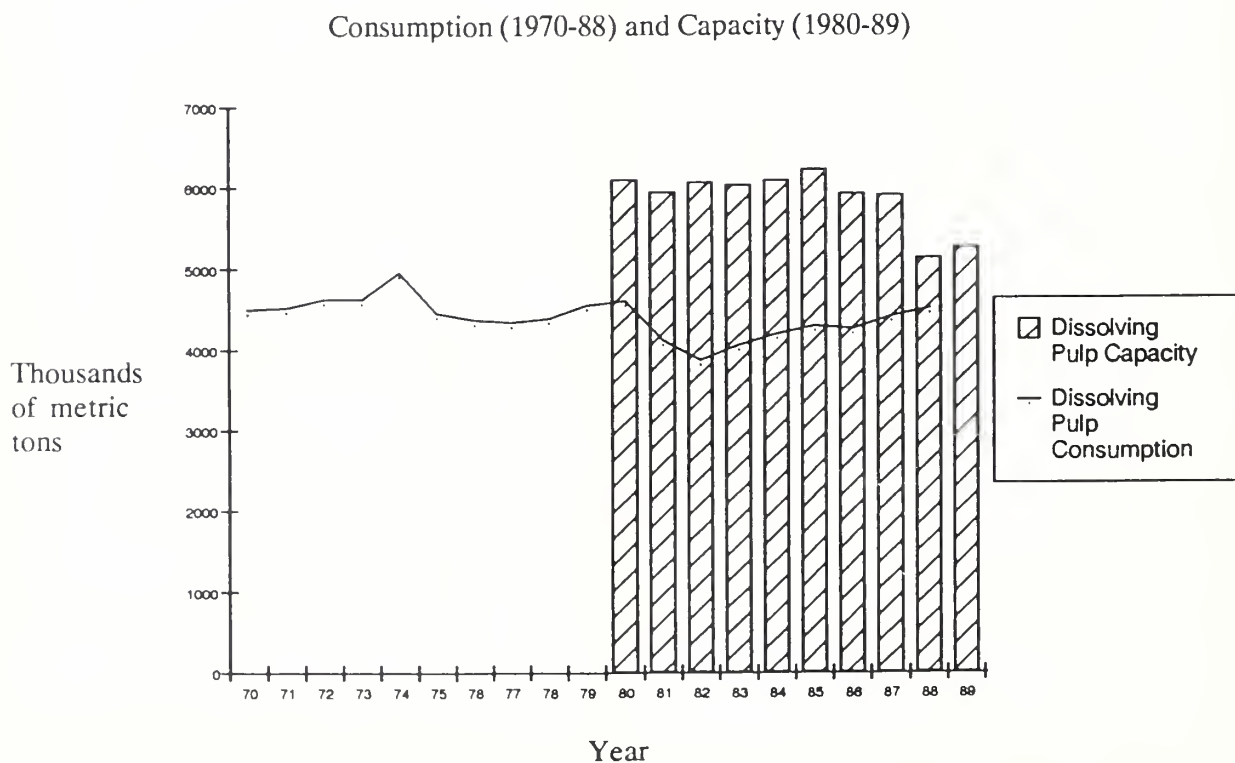


Figure 12. World capacity to produce dissolving pulp declined between 1985 and 1989 while consumption in 1988 was almost equal to consumption in 1970.



In Japan, both production and consumption of dissolving pulp have been decreasing, with production decreasing more than consumption. This widened gap increased Japanese imports of dissolving pulp. As mentioned earlier, imports from Alaska have increased in recent years but are now a smaller share of total Japanese imports than in earlier years (Durbak, 1990). The value of Alaskan dissolving pulp exports to Japan have grown from \$38 million in fiscal year 1985 to over \$82 million in fiscal year 1989.

A similar gap has existed in Western Europe, especially during the 1980s when production decreased sharply. This accounts partly for the increasing imports from Alaska and other sources during the 1980's. With the recent increases in dissolving pulp prices, however, some Western European producers may find it profitable to convert back to dissolving pulp production (Durbak, 1990).

During the 1970s, consumption of dissolving pulp in Eastern Europe and the U.S.S.R. increased sharply. Since 1975, Eastern Europe has been the largest consumer of dissolving pulp. Consumption has been somewhat level in the last few years, thereby allowing production to steadily close the gap (Durbak, 1990). Exports of Alaskan dissolving pulp to the U.S.S.R. have grown from nothing in fiscal year 1985 to more than \$10 million in fiscal year 1989.

In India, dissolving pulp production and consumption have been increasing steadily, as has capacity. The gap between production and apparent consumption has been narrow in recent years. India has been a steady importer of Alaska pulp; in fiscal year 1989, it accounted for 10 percent of Alaska pulp exports.

Of particular relevance to dissolving pulp producers in the Pacific Northwest is the production increase in South Africa. The South Africa mill produces hardwood sulfite pulp mainly for viscose rayon staple production. Two-thirds of its production had been integrated with Courtaulds in the United States, the largest viscose staple producer. An efficient mill, with low production costs, the South Africa mill has also been a strong competitor in southeast Asia markets and drove down prices in the early 1980s (Durbak, 1990). In addition, the for-

eign exchange rate during the 1980s has been favorable for South African exporters; the rand has depreciated much more than U.S. and Canadian currencies against the Japanese yen (Stevens and Adams 1988). In recent years, however, South African exports of dissolving pulp have remained at a constant level. In 1987, they accounted for 14 percent of total world exports (Durbak, 1990).

Trends in use of manufactured fiber

About three-fourths of all dissolving pulp is used to manufacture cellulosic fibers (rayon and acetate). These include viscose rayon staple and filament yarn used mainly for textiles and for tire cords and various industrial products. They also include acetate staple and filament yarn used for textiles and acetate fiber (tow) for cigarette filters (Durbak, 1990).

Since the 1960s, competition has grown from various synthetic (noncellulosic, manufactured) fibers including nylon, polyester, acrylic, olefin, and glass fiber. These fibers have been gaining a sharply increasing share of the total market for manufactured fibers. As a result, there has been a gradual decline in the production and consumption of cellulosic (manufactured rayon and acetate) fibers made from dissolving pulp. In recent years, however, this trend for cellulosic fibers has leveled somewhat (Durbak, 1990).

Natural (nonmanufactured) fibers, especially cotton, have consistently dominated the textile fiber market worldwide. In 1988, world production of textile fibers was 37.2 million metric tons. More than half of the production consisted of natural fibers: cotton, wool and silk. Synthetic fibers accounted for 38 percent of the total, and cellulosic fibers accounted for less than 8 percent. In recent years, the proportion of synthetic fibers has increased, and the proportion of wool and cellulosic fibers has decreased (Durbak, 1990).

The U.S.S.R. is the biggest producer of rayon and acetate and the biggest consumer (figure 13); in 1988, the U.S.S.R. produced and consumed 21 percent of the world total. In all of Eastern Europe, rayon and acetate production has remained relatively constant throughout most of the 1970s and 1980s at 1.0 - 1.5 million metric tons.

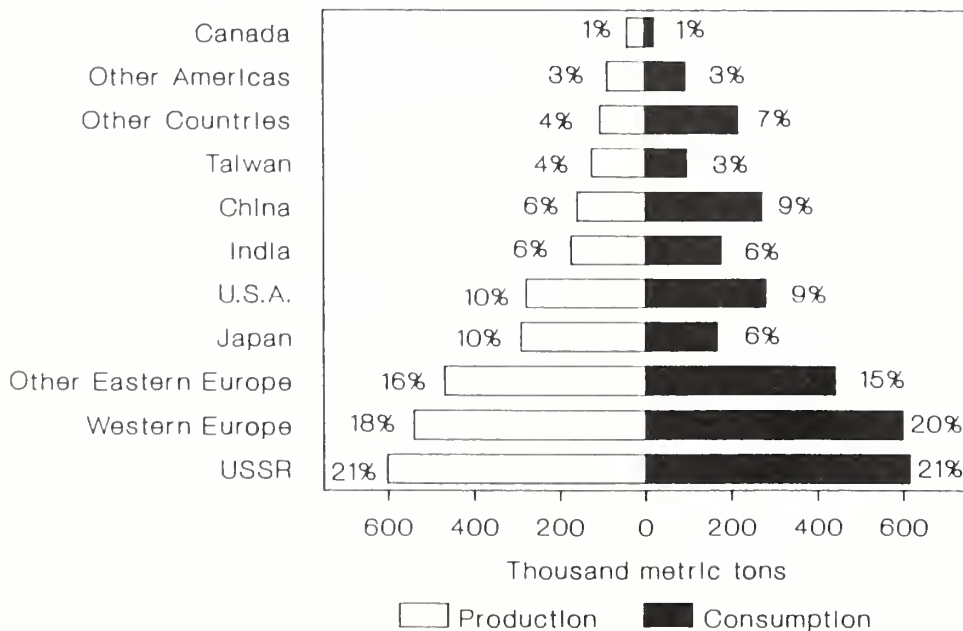
Japan is a net exporter of rayon and acetate fiber. In 1988, it produced 10 percent of the world's rayon and acetate output while absorbing only 6 percent of world consumption. Japanese production of rayon and acetate has been declining gradually since 1980; the decrease has been sharpest in recent years. This has also paralleled the cutbacks in dissolving pulp consumption in Japan (Durbak, 1990).

Production of rayon and acetate in the People's Republic of China and Taiwan increased steadily throughout the 1970s and 1980s, with higher levels reached in China. Production in India declined during 1982 but has been rebounding gradually since then.

In the United States, production of cellulosic textile fiber (excluding acetate fiber for cig-

arette filters) has been decreasing, similarly to the trend in Western Europe. Production declined sharply during the major recession years but maintained the new lower levels in following years. Since 1982, rayon and acetate production has remained level at about 0.3 million metric tons. In contrast, U.S. production and consumption of synthetic fibers has increased sharply, especially during the early 1970s. In 1988, synthetic fibers accounted for 58 percent of total fiber consumption in the United States, cotton and wool accounted for 38 percent, and rayon and acetate fibers accounted for only 4 percent of total fiber consumption (Durbak, 1990).

Figure 13. The U.S.S.R. is the biggest producer and consumer of rayon and acetate.



In 1988, consumption of rayon and acetate textile fiber in the United States was 0.3 million metric tons (excludes 0.2 million metric tons of acetate fiber used for cigarette filters). The largest use (45 percent) was in textiles, for apparel production (Durbak, 1990). Other major uses included fabric for drapery and upholstery (19 percent), filament yarn for various industrial products including tire cords (16 percent), and medical and sanitary products (14 percent).

Use of cellulosic fiber in apparel production, mainly rayon, declined from 1973-1982. Since 1982, use of rayon in apparel production has been stable or increasing. The increases in the use of rayon, in part, reflect the popularity of the high-quality rayon fabric developed in recent years.

Use of cellulosic fiber in the drapery and upholstery industry and has been increasing since 1982. Use of rayon, which was as important as cotton in the late 1970s, has not rebounded as dramatically as cotton since the decrease in 1982 and has lost market share (Durbak, 1990).

The high absorbency of rayon makes it a valuable fiber for various medical and sanitary products, such as gauzes, cotton balls, tampons and diapers. Use of rayon decreased during the late 1970s and early 1980s as use of synthetic fibers increased. Since 1982 use of rayon has been increasing in this nonwovens market (Durbak, 1990).

Rayon and acetate fibers are also used in a wide range of industrial and other consumer products, such as hoses, belting, felts, fiberfill, cordage, paper and tape reinforcing, and tires. Their use, though low in comparison to cotton and synthetic fibers, has remained relatively constant in the last several years (Durbak, 1990).

Use of high-tenacity rayon yarn for tire cord and cord fabric declined sharply during the early 1970s as use of polyester fiber increased. Since 1975, use of rayon declined more gradually, and use of steel, polyester, and nylon has increased. In 1988, use of rayon for tires accounted for only 1 percent of total U.S. consumption of rayon and acetate fiber (Durbak, 1990).

Outlook for consumption of dissolving pulp from Alaska

The long-term trends in production and consumption of dissolving pulp are slowly declining as competing natural and synthetic fibers increase their share of end-use markets. In recent years, a leveling has occurred in the long-term trends with overall stable levels of production and consumption. In certain world markets and for some end-use products, consumption of dissolving pulp has grown. Some producers making sulfite pulp from cheap hardwood fiber may be able to compete with Alaska producers in certain markets; the South African mill may be an example.

Between 1985-89, decreases in production capacity worldwide and favorable exchange rates have allowed Alaska's producers of dissolving pulp to increase export volumes prices. The decline of the United States dollar relative to the yen and other major currencies has been an important factor favoring exports from the United States. A stable weak-dollar position will support the cost-competitiveness of U.S. wood pulp in foreign markets having stronger currencies. As Stevens and Adams (1988) point out, some currencies have depreciated greatly against the Japanese yen; for example, the South African rand. This may influence Japanese imports of dissolving pulp from South Africa.

Current investments and efforts aimed at reducing costs and improving operating efficiency and marketing effectiveness may place dissolving pulp producers in a better position to compete if trends become less favorable. Producers may be able to compete effectively and maintain a strong niche even in a shrinking world market, if they can continue to supply a high-quality product to customers at the lowest possible cost. The Alaskan pulp industry is positioning itself to do that.

In the last few years, both Alaska dissolving pulp mills have improved the efficiency of their operations. Labor costs have decreased and productivity has increased. Using magnesium as a base for their sulfite process enabled them to achieve high levels of chemical recovery. Use of purchased fuel oil has decreased. At the Alaska Pulp Corporation, recovered methane

substitutes for part of the fuel oil needs. At the Ketchikan Pulp Company, most of the needed energy comes from recovered red liquor and hogged fuel. The latter mill has been building a strong market base with a wide range of customers. Both mills have been striving to maximize returns on their wood raw material by increasing production at their sawmill operations and by increasing the use of mill residues in the production of pulp. Finally, both mills have been taking advantage of the recent increased profitability to invest in treatment facilities to meet environmental standards (Durbak, 1990).

Demand for Pulpwood in the Pacific Rim is Projected to Increase

The changes in the world pulp market identified above are crucial because they dominate the direction and strength of the pulpwood demand in Alaska and the Tongass National Forest in particular. During fiscal year 1989, the Pacific Rim fiber market was extremely tight. The appreciation of the yen against most other currencies makes it cheaper for Japanese builders to buy imported lumber when the product meets domestic specifications. Simultaneously, sources of South Sea logs are narrowing as Indonesia and Peninsular Malaysia tighten their bans on log exports and Philippine supplies continue to decline. The Indonesians have been very successful in exporting hardwood plywood into the Japanese markets. In combination, these events have lowered Japanese domestic production of sawnwood and plywood. The smaller sawmill and plywood mill throughput yields less waste and fewer chips available for pulp production.

The corresponding rapid expansion in North American and Japanese consumption of printing and writing paper has driven up the demand for imported pulpwood and chips (see table 8), pulp and waste paper (Japan Pulp & Paper, June 1988a & March 1989). The United States and Australia have taken the largest share of log and chip exports to supply Japan's growing pulpwood demand with additional supply from Canada, New Zealand, South Africa and the USSR.

Table 8. Continued growth in Japanese pulpwood consumption tightened the Pacific Rim market for wood fiber.

Japanese pulpwood consumption. (thousand of cubic meters)			Percent Change
	1987	1988	
Domestic Pulpwood			
Softwood Logs	1,486	1,495	0.6
Hardwood Logs	236	181	-23.3
Softwood Chips	7,229	7,502	3.8
Hardwood Chips	9,521	9,414	-1.1
Total Domestic	18,472	18,597	0.7
Imported Pulpwood			
Softwood Logs	13	106	715.3
Hardwood Logs	60	80	33.3
Softwood Chips	6,398	7,837	22.5
Hardwood Chips	6,968	8,243	18.3
Total Imports	13,939	16,266	16.7
Total Species			
Softwoods	16,785	16,940	0.9
Hardwoods	16,785	17,923	6.8
Total Pulpwood Consumption	33,570	34,863	3.9

Just as growth in the Japanese market is pressuring pulpwood supply around the Pacific Rim, their imports of market pulp are having an equal effect on pulp prices throughout the region. Japanese imports of pulp have risen from 10.9 percent of total consumption in 1976 to 23.4 percent of consumption in 1989 (Japan Pulp & Paper, June 1988b & March 1990). In tonnage, this is an increase in imports from 1 million metric tons in 1976 to 3.3 million metric tons in 1989. Since 1986, rapid increases in the world price of selected softwood pulps have made imported softwood pulp more expensive than domestically produced Japanese softwood grades. Still, the domestic Japanese demand for paper has been so strong that domestic capacity is fully committed. 75 percent of the Japanese pulp imports are from North America. Since the balance of Japanese pulp imports are also from Pacific Rim partners, the pressure on wood fiber remains intense.

Japanese paper consumption is predicted to increase from 27 million metric tons at present to 40 million metric tons in 2000 (Ku-

ramochi, 1990). This 48 percent increase in consumption will be only partially satisfied by growth in domestic pulp production. The gap will be filled by imports which are projected to reach 6 million metric tons by 2000, up 80 percent. The projected 9 percent increase in output of Japanese pulp will come wholly from increased imports of pulpwood and chips (table 8) and efforts to increase recovery of waste paper. In an effort to satisfy this demand, the Japanese industry anticipates purchasing fiber sup-

plies from sources as distant as oak chips from the southern United States (Japan Pulp & Paper, September 1988). In summary, continued strong demand for pulpwood from the Tongass was experienced through fiscal year 1989. Demand for pulpwood is expected to moderate during fiscal year 1990 and 1991 but rebound in fiscal years 1992 and beyond. As well, opportunities to develop hardwood chip exports from Southcentral Alaska seem possible.

FINANCIAL ANALYSIS OF THE TONGASS TIMBER SALE PROGRAM AND THE ECONOMIC IMPACTS OF THE TIMBER SALE PROGRAM ON SOUTHEAST ALASKA

Harvest and processing of timber from the Tongass National Forest provides employment in Southeast Alaska. Revenues from the Tongass timber sale program are shared by the federal government and the State of Alaska. The State of Alaska uses these shared revenues for schools and roads.

The Tongass Timber program is part of a long-term cooperative effort among the federal government, the State of Alaska and local government to provide greater economic diversity in Southeast Alaska and more year-long employment. The Forest Service established requirements to process National Forest timber in Alaska, including the construction and operation of pulpmills via long-term, 50-year timber sale contracts. Maintaining timber supply opportunities for the Southeast Alaska timber industry was a major objective of the Tongass Land Management Plan and the Alaska National Interest Lands Conservation Act. To a large extent the employment objective was met again in fiscal year 1989 -- logging, sawmill, and pulpmill employment in Southeast Alaska is now 19 percent greater than it was in fiscal year 1980 (see table 2).

Clearly, a constant supply of Tongass timber alone cannot assure the maintenance of ANILCA's timber employment objectives. Other controlling factors include exchange rates, the overall Pacific Rim demand for wood fiber and the competitiveness of timber suppliers outside the Tongass National Forest. But, it is certain that with an internationally competitive United States dollar and stable domestic economic growth, the demand for timber from the Tongass National Forest and other ownerships in Southeast Alaska has increased over the past three fiscal years. It is equally clear that Alaskan producers of wood products can survive, prosper and create new jobs in a positive macroeconomic environment which promotes exports from the United States. The Alaska Department

of Labor has noted the success of Alaska's manufacturing sectors, and especially the wood products industry, to continue competing abroad and expanding employment.

"During the good market years of 1986 and 1987, the timber industry posted double digit percentage employment gains. This is strong growth under any circumstances, but especially considering the poor performance of the economy as a whole. In 1986, seafood processing was the only other industry to register any employment gains. Outside of the manufacturing sector, no other major industry groupings posted employment gains during 1986 or 1987. Without the strength of the manufacturing industry, the state's most recent recession would have been even worse."(Rae, 1988)

Timber Sale Program Information Reporting System

TSPIRS, which stands for Timber Sale Program Information Reporting System, is a new information system developed by the Forest Service for evaluating the performance of timber sale programs on individual National Forests. Congress directed the Forest Service to develop and implement a timber sale cost accounting system. This request was in response to concerns about the efficiency of timber sale programs on the National Forests, especially those sale programs where costs were believed to exceed revenues. These are commonly called below-cost timber sale programs. By Congressional request, the Forest Service developed TSPIRS cooperatively with the General Accounting Office (GAO).

Presented in this section are the *Statement of Revenues and Expenses, Economic Account and Employment, Income, and Program Level Account* from TSPIRS for FY 1989 for the Ton-

gass National Forest. A number of technical reports are available to Congress and the public which describe TSPIRS (GAO 1986, GAO 1987, USDA Forest Service 1987). Provided below is a brief description of the how the findings in TSPIRS are calculated and what the numbers mean. This description of TSPIRS is adapted in part from Schuster and Jones, 1989.

How the TSPIRS numbers are calculated.

The Statement of Revenues and Expenses, is an annual financial statement. It matches timber-related costs against the revenues received from the timber harvested on the Tongass in fiscal year 1989. The cost of current and previous investments are included. The calculation of revenues and costs are based on "generally accepted accounting principles" for government as established by GAO. Revenues include cash and assets received from timber sale activities on the Tongass, including stumpage receipts, purchaser road credits established and associated charges such as deposits for brush disposal. Costs for the sale of timber on the Tongass are reported in two broad categories, payments to states and controllable expenses associated with timber harvesting. Controllable expenses include annual costs such as sale administration, general administration and depreciation on agency-funded facilities. Also counted as controllable expenses are allowances from two cost pools.

GAO defines cost pools as deferred-cost asset accounts. One pool accounts for long-term timber development or investment costs (the growth activity pool) and the other deals with short-term or temporary sale operation costs (the sale activity pool). Each pool consists of costs in specified categories accumulated over several years, including fiscal year 1989. Costs are not discounted but enter the pool at current value. The sale activity pool includes multi-year costs attributable to specific timber sales, for example, timber sale preparation. The growth activity pool includes costs which cannot be assigned to an individual timber sale but serve the whole timber sale program or support timber sales in a region or complete drainage. Arterial or main-line roads are a good example of a cost item serving a number of timber sales

over many years, and therefore, an item entered as a cost in the growth activity pool.

A percentage of each cost pool was counted as an expense in fiscal year 1989. For example, the percentage of the sale activity pool charged as a current expense is based on the ratio of volume harvested to the sum of volume under contract plus volume harvested. In sum, the Statement of Revenues and Expenses shows that the Tongass experienced a net gain of \$1.2 million on its timber sale program in fiscal year 1989.

The Economic Account, displays current and future long-term benefits and costs from the acres receiving timber treatments in fiscal year 1989. Unlike the single-year time frame of the Statement of Revenues and Expenses, the Economic Account has an infinitely long time horizon. Future costs and benefits are discounted to fiscal year 1989.

The purpose of the Economic Account is to display the net present value of the acres affected by timber harvest in fiscal year 1989. Net means positive or negative. Present is defined as discounted costs or benefits. And finally, value refers to the monetized worth of the output produced through the timber sale program. Desirable outputs such as increased hunter-days are considered positive effects while undesirable outputs such as increased sedimentation are assessed as negative effects.

The money spent to establish a new stand of trees is counted as a cost today. Future returns to the government of selling the timber and costs of management are discounted. This is to say the future dollars are compared with dollars invested today which would earn a four percent return on investment after inflation. For example, if an investment yields an eight percent annual return but inflation averages four percent, then the investment, in fact yields a four percent return net of inflation.

The TSPIRS Economic Account for the Tongass National Forest finds that the program of forest management established for the acres harvested in fiscal year 1989 will yield a positive present net value of \$10.2 million.

The Employment, Income, and Program Level Account supplements the findings displayed in the Statement of Revenues and Expenses, and the Economic Account with infor-

mation such as the local economic impacts of the timber sale program. Also reported are general data on the timber sale program such as volume and acres harvested, acres of young stands receiving silvicultural treatments and a display of the miles of road built to support the timber sale effort.

Impacts of the timber sale program on the local economy are estimated using an economic model of Southeast Alaska (McHugh et.al.

1989). Reported are the economic impacts of the harvest and processing of timber from the Tongass National Forest in fiscal year 1989. The employment levels supported by the timber sale program are reported in full-time equivalents. For example, one full-time equivalent in logging may actually represent two timber-felling jobs where each employee is working only six months per calendar year due to weather conditions in Alaska.

STATEMENT OF REVENUES AND EXPENSES

Revenues compared to costs - This is similar to a private business profit and loss statement.

I. REVENUES	
Timber Sales	\$3,573,281
Purchaser Road Credit	17,194,336
Associated Charges	270,954
Interest and Penalties	72,885
Total Revenues	\$21,111,456
II. EXPENSES	
Sale Administration	\$3,192,144
Sale Activity Allowance	4,916,827
Growth Activity Allowance	3,044,602
Facilities depreciation	538,974
General Administration	3,200,577
Total Operating Expenses	\$14,893,123
Gain/<Loss> Before Payments to State	\$6,218,332
III. PAYMENT TO STATE	\$4,989,178
Net Gain/<Loss> From Timber Sales	\$1,229,154
IV. VOLUME HARVESTED (in board feet)	444,606,000

THE ECONOMIC ACCOUNT

Long term benefits, effects, and costs expected from the acres harvested in 1989. This account is tied to Forest Plan data.

I. PRESENT VALUE BENEFITS	
Timber	\$25,972,319
Recreation	0
Wildlife	26,685
Fisheries	3,912,963
Total Present Benefits	\$29,911,967
II. NEGATIVE EFFECTS	
Wildlife	\$611,801
III. INVESTMENTS VALUE	
Timber	\$18,200,561
Roads	46,775
Recreation	0
Wildlife	0
Fisheries	821,968
Total Investments	\$19,069,304
IV. PRESENT NET VALUE	\$10,230,862

EMPLOYMENT, INCOME, AND PROGRAM LEVEL ACCOUNT

Current effects to local employment and income from harvest activities.

I. EMPLOYMENT	
Direct Jobs	2,083
Indirect & Induced Jobs	1,776
Total Jobs	3,859
II. LOCAL FISCAL EFFECTS	
Total Personal Income	\$128,505,000
Fed. Inc. Tax Generated	\$24,416,000
Cumulative Value to Local Communities	\$530,000,000
25% Fund Payment to State	\$4,989,178
III. TIMBER PROGRAM ACCOMPLISHMENTS	
Offered - net sawlog vol.	320,000,000
Sold - net sawlog vol.	252,000,000
Harvested - net sawlog vol.	377,000,000
- utility	68,000,000
Total Harvest	445,000,000
Regeneration Treatment (acres)	7,908
Timber Stand Improvement (acres)	2,414
Total Area Harvested (acres)	13,470
IV. MILES OF ROADS TO SUPPORT TIMBER PROGRAM	
Appropriated	8
Purchaser Credit	149
Total	157

CONCLUSION

International exports, prices and employment in Southeast Alaska's forest products industry surpassed historic peaks in fiscal year 1989. Increased exports of logs, lumber and pulp reflected strong economic growth throughout the Pacific Rim and an internationally competitive United States dollar.

Slow but steady growth in both the United States and Japanese economies has stimulated output and consumption in Taiwan, China, Hong Kong, Singapore and South Korea. In combination with the rapid growth of the printing and writing paper sector, the growth in these economies is strapping the capacity of Pacific Rim wood suppliers. Alaska's select grade logs and best dimension lumber are travelling to Japan where the stronger yen has given consumers tremendous buying power. Korean and Taiwanese manufactures are processing Alaska's construction grade logs and lumber both for domestic demand and exports to the Middle East.

While packaging papers and boards have followed industrial production upward across the Pacific Rim, it is the phenomenal growth in printing & writing papers which have driven pulp prices up for almost four years. The price increases affect Alaska in two ways. First, hardwood shipments from Southcentral Alaska are continuing. Second, by absorbing dissolving pulp capacity elsewhere, the pressure on pulp prices have bolstered operating rates and profitability of pulp producers in Southeast Alaska.

Timber harvest on the Tongass National Forest in Southeast Alaska continues to increase. Since 1981, actual timber harvests on the Tongass have been below the demand projected in the Forest Plan due to macroeconomic factors affecting exports from the United States from 1981 through 1985. On average, 425 MMBF annually has been made available to the forest products industry from the Tongass National Forest. Of the 425 MMBF made available about 93 percent has been sold/released. Although the ANILCA timber supply and employment goal has been met, it is unlikely that an average of 450 MMBF of Tongass timber will be sold this decade. On the basis of Forest Plan criteria, a Tongass timber supply of 4.5 BBF per decade can be maintained.

REFERENCES

- Alaska Dept. of Commerce & Economic Development.* 1990. Directory of Alaska Forest Products Manufacturers 1990. Juneau, Alaska.
- Durbak, Irene.* 1990. Market trends and prospects for dissolving wood pulp. USDA Forest Service, Pacific Northwest Research Station, Research Note(in press).
- Food & Agricultural Organization of the United Nations(FAO).* 1988. Forest Products: World Outlook Projections. FAO Forestry Paper 84, Statistics and Economic Analysis Staff, Forestry Dept. FAO. Rome, Italy.
- Food & Agricultural Organization of the United Nations(FAO).* 1990. Pulp and Paper Capacities, 1989-1994. Statistics and Economic Analysis Staff, Forestry Dept. FAO. Rome, Italy.
- Food & Agricultural Organization of the United Nations(FAO).* 1990. 1988 Yearbook of Forest Products. Statistics and Economic Analysis Staff, Forestry Dept. FAO. Rome, Italy.
- General Accounting Office.* 1986. Timber sale accounting-analysis of Forest Service's proposed timber program information reporting system. U.S. General Accounting Office GAO/AFMD-86-42.
- General Accounting Office.* 1987. Timber program - a cost accounting system design for timber sales in national forests. U.S. General Accounting Office GAO/AFMD-87-33.
- Japan Pulp & Paper.* June 1988a. "The strong yen alters Japan's material policy into more imports". p25-29.
- Japan Pulp & Paper.* June 1988b. "Despite soaring prices, the share imported pulp is moving up". p30-31.
- Japan Pulp & Paper.* September 1988. "Industry trend to watch". p19.
- Kuramochi, Choji.* 1990. Japan's Pulp and Paper Industry: Its Characteristics and Future Tasks. Proceedings of the 2nd International Symposium on Pulp and Paper: Global Resources and Markets -- Issues and Trends. Center for International Trade in Forest Products, College of Forest Resources, Univ. of Washington. Seattle, Washington.
- McHugh, Paul, Douglas Olson, Con Schallau, Scott Lindall, Hossein Akhavi-Pour, and Wilber Maki.* 1989. Alaska IPASS Database Preparation Manual. USDA Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-233. Portland, Oregon.
- Pulp & Paper.* vol. 61(8) 1987 and vol. 63(8) 1989, "World Review."
- Pulp & Paper.* vol. 63(7) 1989, "Canadian capacity increases greatest in printing, CTMP."
- Pulp & Paper Week.* July 25, 1988. Market Pulp.
- Rae, Brian N.* 1988. Alaska Economic Trends. "Alaska's Timber Industry." Alaska Department of Labor, Research and Analysis Section. October 1988 issue. Juneau AK.

Rogers, George W. 1989. The Impact of the Long Terms Contracts on the Economy of Southeast Alaska: 1954-1988. In conference proceedings, The Future of the Timber Industry in Southeast Alaska, University of Alaska Southeast, Ketchikan. Ketchikan, Alaska.

Schuster, Ervin G. and J.Greg Jones. March 1989. TSPIRS: Meet the New Kid on the Block. Journal of Forestry, March 1989, pp31-35. Society of American Foresters, Bethesda, Maryland.

Stevens, James A. and Darius Adams. 1988. Opportunities for expansion of Alaska's market pulp exports. Seattle, WA: Unpublished report on file with College of Forest Resources, Center for International Trade in Forest Products, University of Washington.

USDA Foreign Agricultural Service. 1988. Wood Products: International Trade and Foreign Markets. Circular Series WP 4-88. December 1988. Washington, D.C.

USDA Foreign Agricultural Service. 1990. Wood Products: International Trade and Foreign Markets. Circular Series WP 1-90. March 1990. Washington, D.C.

USDA Forest Service. 1987. Timber Sale Program Information Reporting System - final report to Congress. Unpublished report, USDA Forest Service, Policy Analysis. Washington, D.C.

US Department of Commerce. 1990. Bureau of Economic Analysis, Survey of Current Business, April 1990.

Warren, Debra D. various. Production, prices, employment, and trade in northwest forest industries, issued quarterly. USDA Forest Service. Pacific Northwest Research Station. Resource Bulletin various issues. Portland, OR.

NATIONAL AGRICULTURAL LIBRARY



1022541719

* NATIONAL AGRICULTURAL LIBRARY



1022541719